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ABSTRACT

This is the teacher's manual to accompany part 1 of the workbook for grade 6 pupils in the Comprehensive Instructional Management System, a teacher-designed unified mathematics curriculum for kindergarten through grade 7. It is composed of a curriculum, a testing component, and a computer-managed reporting system. The curriculum is organized into modules of similar skills or understandings from 14 topics. Each module has: a suggested period of duration for student mastery; a listing of new skills to be mastered by the student in the form of performance objectives; a section devoted to vocabulary, terms, and symbols; getting-started activities on prerequisite skills in preparation for undertaking new objectives; strategies for teaching the new skills; and student activities for providing reinforcement for the newly learned objective. After the sequence of modules and content by topic are displayed, teaching suggestions for 58 modules on over 75 performance objectives are given. The content is from the topics of: numbers and numeration; addition; subtraction; fractions; geometry; measurement; algebraic concepts; graphs, probability, and statistics; and problem solving, plus review. Pages from the student's workbook are interspersed with the suggested activities. (MNS)

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CIMS

COMPREHENSIVE INSTRUCTIONAL MANAGEMENT SYSTEM

A Cyclical Mathematics Curriculum

PART 1—TEACHER

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FOREWORD

The Comprehensive Instructional Management System (CIMS) is a unified mathematics curriculum for grades K-7. The curriculum is cyclical in design, and reflects the most recent New York City and New York State guidelines.

Utilizing the experience of our system's teachers, we have developed a teacher-designed curriculum that includes a rich selection of classroom-tested successful mathematics activities. The major goal of the CIMS mathematics project is to provide the classroom teacher with a well-structured, objective-based curriculum. All objectives are supported by a variety of strategies. Student mastery of these objectives is readily diagnosed through the system's testing component.

The curriculum format is structured to allow the teacher to determine the ability level of the students in the topic under study, and to permit the students to move forward at their individual rates. Each module of instruction provides the teacher with a set of related performance objectives. These objectives are supported by activities which probe and develop the students' readiness to undertake new skills and concepts. Further reinforcement is given to mastery of the objectives through accompanying student workbooks.

It is hoped that this curriculum will not only assist teachers in developing vital mathematics instruction, but will serve to expand and enrich students' mathematics skills.

Charlotte Frank

Charlotte Frank,
Executive Director
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ACKNOWLEDGMENTS

The Comprehensive Instructional Management System (CIMS) was developed as a project of the Division of Curriculum and Instruction, Charlotte Frank, Executive Director. Dr. Peter Negroni, Community School Superintendent CSD 12; Dr. Harvey Garner, Community School Superintendent CSD 18; Carlos Edwards, Community School Superintendent CSD 23, and Joseph Pacheco, Community School Superintendent CSD 32 supervised the overall development of the CIMS program within their respective districts.

Morris Freedman, Director of the Office of Curriculum Development and Support; Irwin Kaufman, Director of Mathematics; Kenneth Bates, Director of CIMS; Maria DeSalvio, Assistant Director of Mathematics; Arthur Flug and Doreen Genkin, Assistant Directors of CIMS and Gene Menchini, Program Manager, Distributive Systems, Office of Data Processing Coordination provided overall supervision of this project.

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INTRODUCTION

The Comprehensive Instructional Management System (CIMS) is a teacher-designed educational delivery system composed of a curriculum, a testing component and a computer managed reporting system.

Designed to support mathematics instruction in the classroom, CIMS provides a comprehensive cyclical mathematics curriculum for grades K through 7. Each manual describes the curriculum for a single level or grade. Teacher curriculum developers from elementary, intermediate and senior high schools utilized the most current New York City and New York State guidelines in formulating the curriculum's modules and sequence.

Curriculum Topics

The CIMS mathematics curriculum has been organized into the following 14 topics:

.01 Numbers and Numeration
.02 Addition of Whole Numbers
.03 Subtraction of Whole Numbers
.04 Multiplication of Whole Numbers
.05 Division of Whole numbers
.06 Fractions
.07 Decimals
.08 Integers
.09 Geometry
.10 Measurement
.11 Algebraic Concepts
.12 Graphs, Probability, Statistics
.13 Problem Solving
.14 Review

Modules of Instruction

The CIMS curriculum is organized into modules or groupings of similar skills or understandings. Each module has a suggested period of duration for student mastery, a listing of new skills to be mastered by the student in the form of performance objectives, a section devoted to vocabulary, terms and symbols, getting started activities which serve as prerequisite skills in preparation for undertaking new objectives, strategies for teaching the new skills and student activities for providing reinforcement for the newly learned objective. Note that the lesson duration is included only as a guideline to the teacher for planning purposes. The actual time required for each module will vary from class to class and from child to child depending on the needs of the students and the teacher's judgment.

Priorities of Performance Objectives

There is an order of priority to be recognized in teaching the content presented in the CIMS NEW YORK CITY MATHEMATICS CURRICULUM. Performance objectives with the greatest priority are so basic that unless the student acquires a satisfactory degree of competency in them, the student cannot progress. Such topics are marked A and mastery by all pupils is essential.

Performance objectives marked B are required to be presented to all students. Mastery is not expected at this time. These objectives will be developed further and reinforced later.

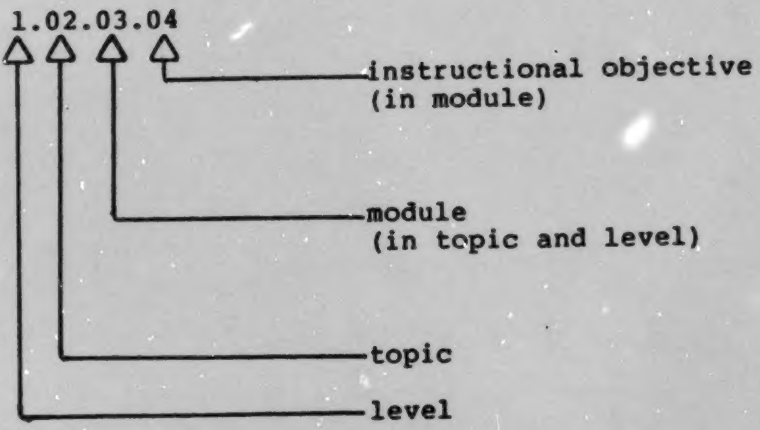
Performance objectives marked C are of special interest. These should be taught to increase positive attitudes towards mathematics.

Summary:
- A - Mastery of this objective is essential for progress. Opportunities for reinforcement should be provided throughout the school year.
- B - These objectives are to be taught to all pupils. Mastery is not essential at this time because the topics will be further developed and reinforced.
- C - Objectives of special interest.

Topic Tab Key

01. Numbers and Numeration
02. Addition of Whole Numbers
03. Subtraction of Whole Numbers
04. Multiplication of Whole Numbers
05. Division of Whole Numbers
06. Fractions
07. Decimals
08. Integers
09. Geometry
10. Measurement
11. Algebraic Concepts
12. Graphs, Probability, Statistics
13. Problem Solving
14. Review

Module Coding Key


1.02.03.04
instructional objective
(in module)
module
(in topic and level)
topic
level

INSTRUCTIONAL SEQUENCE DESCRIPTION

An instructional sequence is given in list form on the following pages for this level. The sequence has been arranged to reflect what is considered the most effective presentation of the mathematics curriculum. Each module in the list is described by its unit number, module number, title, and page location.

The CIMS tests are integrated within the manual sequence. The test number is located in the first column. Each test is designed to assess priority objectives from the preceding modules. The tests are used to determine student mastery of specific performance objectives within these modules and appear in a multiple choice format. Each performance objective code number preceded by an * indicates that the performance objective is not tested on a CIMS test.

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INSTRUCTIONAL SEQUENCE - LEVEL 6

TEST NUMBER	UNIT NUMBER	MODULE NUMBER	TITLE	PAGE NUMBER
	1	6.14.01	Place value..............................	1
	2	6.14.02	Problem solving - review....................	2
	3	6.01.01	Read, write and understand large numbers...	4
	4	6.14.03	Graphs....................................	6
	5	6.14.04	Add 5-digit numbers.........................	9
6.01	6	6.14.05	Subtract 3- through 5-digit numbers........	10
	7	6.14.06	Angles.....................................	12
	8	6.14.07	Set notation and Venn diagrams.............	14
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	11	6.01.03	Prime numbers..............................	18
	12	6.13.01	Organize data to perceive patterns.........	19
	13	6.10.01	Perimeter of polygons......................	21
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INSTRUCTIONAL SEQUENCE - LEVEL 6

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	48	6.10.07	Scale drawings	66
	49	6.13.04	Use models to solve problems	67

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INSTRUCTIONAL SEQUENCE - LEVEL 6

TEST NUMBER	UNIT NUMBER	MODULE NUMBER	TITLE	PAGE NUMBER
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	51	6.06.06	Division of fractions	70
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LEVEL 6

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6.14.04 Add 5-digit numbers........................ 9
6.14.05 Subtract 3- through 5-digit numbers........................ 10
6.14.06 Angles........................ 12
6.14.07 Set notation and Venn diagrams........................ 14
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6.14.08 Fractions........................ 23
6.14.09 Tenths and hundredths in decimal form........................ 31
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6.14.01 PLACE VALUE

(ongoing)

PERFORMANCE OBJECTIVES

The student will be able to...

6.14.01.01 identify and write the place value of numbers through 99,999;

e.g.,

```
1,234  =  1000
           200
            30
             4
```

6.14.01.02 identify and write a numeral through 6-digits in expanded notation;

e.g.,

684,375 = 600,000 + 80,000 + 4,000 + 300 + 70 + 5

6.14.01.03 identify and write numerals through 6-digits when given the expanded form.

e.g.,

300,000 + 60,000 + 2,000 + 400 + 60 + 2 = 362,462

6.14.01

VOCABULARY

TERMS

expanded notation

GETTING STARTED

Ask a student to roll a 0 through 5 number cube four times. Record the numbers on the chalkboard. Say, "We want to form the largest number using these four digits." Draw a place-value chart on the chalkboard. Ask, "How should we label each column?"
e.g.,

Thousands	Hundreds	Tens	Ones

Say, "What number should be placed in the thousands column? (The largest digit that was rolled.) "What should we place in the hundreds column?" (The next largest number.)

Complete the chart by filling in all four columns.
e.g.,

Th	H	T	O
5	4	3	1

Ask, "How should this number be read?" (Five thousand, four hundred, thirty-one.)

Play, "I Am The Greatest," between two students or two teams. Each player draws four place value spaces on paper or on the chalkboard.
e.g., __ __ __ __

A student rolls the 0 through 5 number cube once. Ask the players to place the number rolled in any of one of the four spaces. Remind the students that their goal is to make the largest possible 4-digit number. Repeat the roll three more times, stopping after each roll to write a number in any of the remaining empty spaces.

Students should compare their numbers to see who made the largest one. The student or team who has the largest number gets a point. The student or team to get five points first, wins.

GETTING STARTED cont'd

This game may be varied by using a cube with the numerals 4 through 9 and changing the goal to the smallest 4-digit number.

Ask four students to stand facing the class. Give them a box in which there are four sets of cards marked with numerals from 0 through 9. Ask the students to make various combinations of 4-digit numbers by selecting four cards. Ask the students to read each one aloud so that the class can write them into their notebooks. Discuss each digit's place value. Compare the size of the numbers.

e.g.,

$\boxed{2}\ \boxed{5}\ \boxed{8}\ \boxed{4} = 2,584$

$\boxed{3}\ \boxed{4}\ \boxed{0}\ \boxed{1} = 3,401$

$3,401 > 2,584$

6.14.01

6.14.01.01 **identify and write the place value of numbers through 99,999**

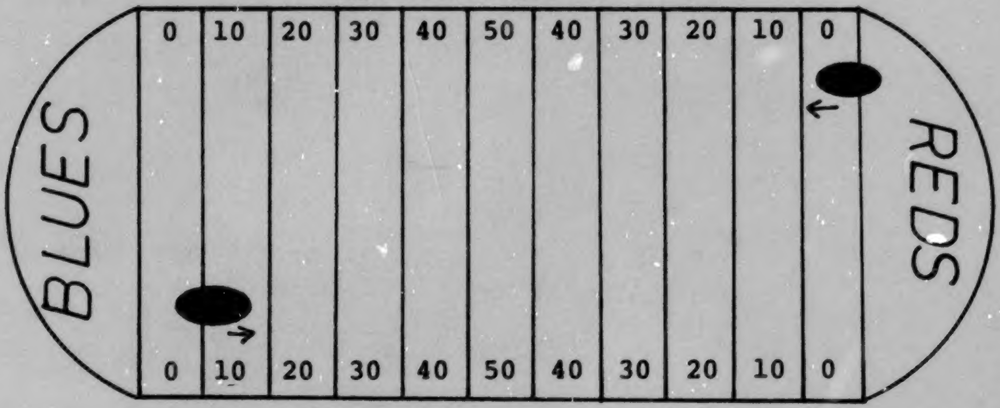
STRATEGY 1: Provide students with blank place value charts, having five columns.
e.g.,

ten thousands	thousands	hundreds	tens	ones
7	6	2	5	8

Write a similar chart on the chalkboard. Ask one student to randomly choose a 5-digit number, e.g., 76,258. Ask,"How can we write this number on our place-value chart?" Ask one student to write the number on the chalkboard. Ask,"How many ones do we have?" (8) Write this number in the ones column. "How many tens?" (5) Write this number in the tens column. "How many hundreds?" (2) Write this number in the hundreds column. "How many thousands?" (6) Write this number in the thousands column. "How many ten thousands?" (7) Write this number in the ten thousands column. Ask, "What is the value of the 2 in the number." (Two hundreds or 200.) "What is the value of the 6?" (Six thousands or 6,000.) "What is the value of the 7?" (7 ten thousands or 70,000.) Using other students, select additional 5-digit numbers. Discuss the place value of each digit in each number.

STRATEGY 2: Draw this football game diagram on the chalkboard.
e.g.,

"Math Football"



Make two "footballs" of different colors.

Divide the class into two teams. Ask the teams to select their own team names. The teams must move the football from their end zone to the opposition's end zone. Each time a member of a team correctly answers a question, the team gets to move the team football forward ten yards. When the football is moved across the entire field, it is called a touchdown. Determine the number of touchdowns needed to win before the game starts.

On 35-40 oaktag strips, write out the names of some numbers through 99,999.
e.g.,

Sixty thousand two hundred four

Seventy-nine thousand five hundred

Nine thousand twenty

Fifteen thousand one hundred seven

Place these cards face down on a desk. Ask a student to select a card, read the number, and then write the number on the chalkboard.

6.14.01

STRATEGY 2: cont'd

Alternate each team. If one team writes the number incorrectly, the other team may gain an extra ten yards by answering the opposition's question and then his/her own correctly. Continue until one team wins with a specific number of touchdowns.

6.14.01.02 **identify and write a numeral through 6-digits in expanded notation**

STRATEGY 1:

Discuss the place value of digits through hundred thousands by asking the students to place digits in their proper position on a place value chart as the numbers are dictated.
e.g., 231,465

Ask, "How many hundred thousands are in this numeral." (2) Write 200,000 on the chalkboard, but not on the place value chart.

Ask, "How many ten thousands are in this numeral?" (3)

Write 30,000 below 200,000.
e.g.,
200,000
30,000

Ask, "How many thousands are in the numeral?" (1) Write 1,000 under the 30,000. Ask, "How many hundreds?" (4) "Tens?" (6) "Ones?" (5)

Each time, write the response given below the previous response until each digit is written in the following pattern.

23

STRATEGY 1: cont'd

Add all of the numbers to demonstrate that this expanded form of the number does not change the value of the original number.

e.g.,

$$\begin{array}{r} 200,000 \\ 30,000 \\ 1,000 \\ 400 \\ 60 \\ 5 \\ \hline 231,465 \end{array}$$

Write other 6-digit numerals in expanded form; e.g.,

360,281

900,423

350,001

521,130

Emphasize the meaning of the zero as a place-holder in each of these numbers.

STRATEGY 2:

Provide each student with a place value chart and draw a blank chart on the chalkboard. Identify each column of the place value chart in words as well as numbers.

e.g.,

Hundred Thousands (100,000)	Ten Thousands (10,000)	Thousands (1000)	Hundreds (100)	Tens (10)	Ones (1)
3	2	9	8	4	7

Dictate the number 329,847. Ask the students to write the number on their chart.

STRATEGY 2: cont'd

Ask, "How many hundred thousands are there?" (3) Write it as (3 x 100,000), emphasizing "3 times 100,000." Ask, "How many ten thousands?" (2) Write it as (2 x 10,000), emphasizing "2 times 10,000." Ask, "Thousands?" (9) Write as (9 x 1,000), emphasizing "9 times 1,000." Ask, "Hundreds?" (8) Write as (8 x 100), emphasizing "8 times 100." Ask, "Tens?" (4) Write as (4 x 10), emphasizing "4 times 10." Ask, "Ones?" (7) Write as (7 x 1), emphasizing "7 times 1." Say, "Let's examine our number."

Write (3 x 100,000) on the chalkboard. Ask," What does this equal?" (300,000) Write the answer on the chalkboard.

e.g.,

3 x 100,000 =	300,000	
2 x 10,000 =	20,000	What is 2 x 10,000?
9 x 1,000 =	9,000	What is 9 x 1,000?
8 x 100 =	800	What is 8 x 100?
4 x 10 =	40	What is 4 x 10?
7 x 1 =	7	What is 7 x 1?
	329,847	Add

6.14.01.03 **identify and write the numeral through 6-digits when given the expanded form**

STRATEGY 1: Provide a student with a 0 through 5 number cube.

Ask him/her to roll it six times. Record each roll on the chalkboard as follows:

6.14.01

STRATEGY 1: cont'd

e.g.,
Student rolls a 5 - Record it as 500,000.
Next 2 is rolled. Record it as 20,000.
Next 3 is rolled. Record it as 3,000.
Next 4 is rolled. Record it as 400.
Next 2 is rolled. Record it as 20.
Next 1 is rolled. Record it as 1.

Ask, "What 6-digit number was rolled?." (523,421.) (We add to get the standard numeral from the expanded form.)

Ask another student to roll the cube six times. Record the numbers in the expanded form, this time using a horizontal format.
e.g., Roll a 2; 3; 1; 0; 4; and a 5.

$$200{,}000 + 30{,}000 + 1{,}000 + 0 + 40 + 5 = 213{,}045$$

Emphasize the zero as 0 hundreds. Continue with other 6-digit numerals, changing the cube to a 4 through 9 or a 5,6,7,8,9,0 cube.

STRATEGY 2: Prepare the following oaktag cards: 300,000; 20,000; 2,000; 600; 80, and 7. Give six students one card and ask him/her to hold it up. Ask, "What standard numeral can we get from these numerals? How can we get it?" (We should add the expanded numerals to get the standard numeral.) Record these numbers on the chalkboard.
e.g.,

$$\begin{array}{r}
300{,}000 \\
20{,}000 \\
2{,}000 \\
600 \\
20 \\
7 \\
\hline
322{,}687
\end{array}$$

STRATEGY 2:
cont'd

Ask, "What is the standard numeral?" (The standard numeral is 322,678.)

Write other 6-digit numerals in expanded form on the chalkboard. Ask the students to write the standard numeral.

e.g.,

500,000 + 30,000 + 2,000 + 100 + 70 + 8 = 532,178
900,000 + 1,000 + 300 + 50 + 1 = 901,351

Repeat this procedure, until the pattern is recognized.

P.O. 6.14.01.01

NAME: ______________________ CLASS: ________ DATE: ________

I. Place each number in its proper position on the place value chart.

a. 22,017

T Th	Th	H	T	O
2	2	0	1	7

b. 13,205

T Th	Th	H	T	O

c. 65,268

T Th	Th	H	T	O

d. 99,989

T Th	Th	H	T	O

e. 59,310

T Th	Th	H	T	O

f. 40,301

T Th	Th	H	T	O

II. Fill in the blank spaces to show the value of each digit.

a. 30,016

In this numeral there are:

___1___ tens

___3___ ten thousands

___6___ ones

___0___ thousands

___0___ hundreds

b. 61,567

In this numeral there are:

______ thousands

______ tens

______ hundreds

______ ten thousands

______ ones

P.O. 6.14.01.01

NAME:________________________ CLASS:__________ DATE:________

Fill in the blank spaces to show the value of each digit.

c. 57,049
In this numeral there are:
_____ones
_____thousands
_____tens
_____ten thousands
_____hundreds

d. 15,960
In this numeral there are:
_____tens
_____ones
_____ten thousands
_____thousands
_____hundreds

e. 71,967
In this numeral there are:
_____tens
_____ten thousands
_____ones
_____thousands
_____hundreds

f. 36,006
In this numeral there are:
_____thousands
_____tens
_____ones
_____hundreds
_____ten thousands

P.O. 6.14.01.02

NAME: ________________________ CLASS: __________ DATE: ________

Directions: I. Write each numeral in its expanded form.
II. What is the value of the underlined digit?

I.

A) 543,210 = (500,000 + 40,000 + 3,000 + 200 + 10)

B) 792,003 = ______________________________

C) 430,049 = ______________________________

D) 841,167 = ______________________________

E) 600,009 = ______________________________

F) 564,196 = ______________________________

G) 762,008 = ______________________________

II.

A) 34$\underline{7}$,836 ___7,000___

B) 2$\underline{8}$9,501 ______________

C) 416,$\underline{5}$09 ______________

D) 6$\underline{0}$9,732 ______________

E) $\underline{8}$30,147 ______________

F) 964,17$\underline{5}$ ______________

G) 45$\underline{3}$,097 ______________

H) $\underline{6}$56,161 ______________

I) 957,7$\underline{7}$8 ______________

J) 11$\underline{6}$,519 ______________

K) 899,$\underline{9}$98 ______________

P.O. 6.14.01.03

NAME:______________________________ CLASS:________ DATE:_______

Directions: A. Write the standard form for the following expanded numerals.
B. Write the standard numeral, given the place value.

[A.]

1) 300,000 + 60,000 + 9,000 + 200 + 40 + 7 = (369,247)

2) 100,000 + 70,000 + 5,000 + 100 + 90 + 8 =__________

3) 600,000 + 90,000 + 3,000 + 200 + 70 + 9 =__________

4) 500,000 + 7,000 + 900 + 60 + 3 =__________

5) 400,000 + 800 + 90 + 6 =__________

6) 300,000 + 40,000 + 8 =__________

7) 900,000 + 80,000 + 7,000 + 100 + 30 + 5 =__________

8) 200,000 + 6,000 + 500 + 20 + 1 =__________

9) 700,000 + 50,000 + 300 + 40 + 8 =__________

10) 800,000 + 30,000 + 80 + 7 =__________

11) 600,000 + 40,000 + 500 + 9 =__________

12) 900,000 + 200 + 10 + 4 =__________

[B.]

1) 3 hundred thousands, 4 thousands, 6 hundreds one = (304,601)

2) 90 thousands, 5 hundreds, 2 tens, two =__________

3) 1 hundred thousand, 2 ten thousands, 6 tens =__________

4) 5 hundred thousands, 5 thousands, 7 hundreds, 7 tens =__________

5) 4 ten thousands, 6 thousands, 3 hundreds, two tens, five =__________

6) 8 hundred thousands, 6 thousands, 9 hundreds, 1 ten, three =__________

7) 9 ten thousands, 6 thousands, 8 hundreds, 4 tens, eight =__________

8) 2 hundred thousands, 5 ten thousands, nine =__________

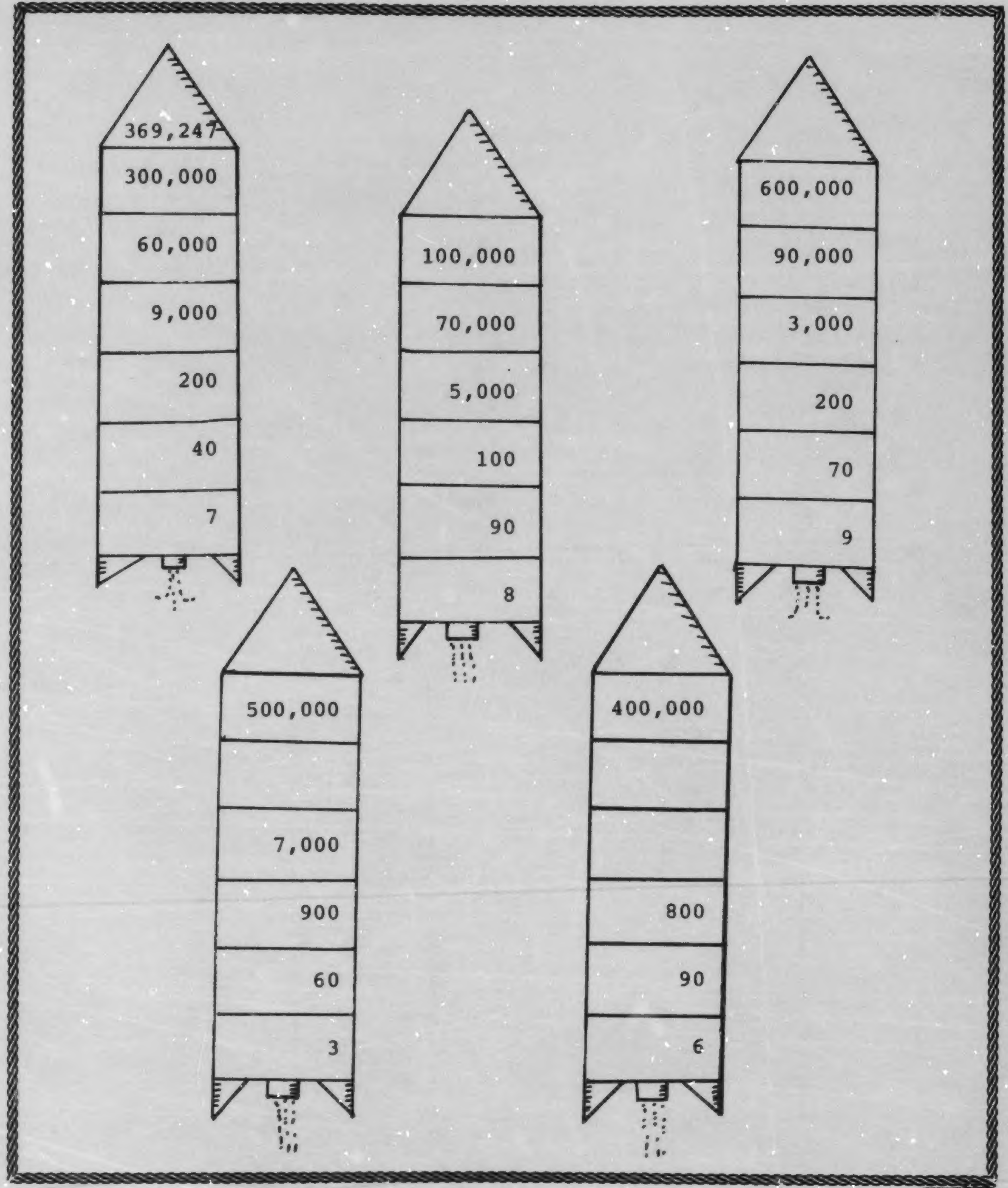
9) 4 hundred thousands, 6 thousands, 9 hundreds, two =__________

14

P.O. 6.14.01.03

NAME:____CLASS:_________DATE:______

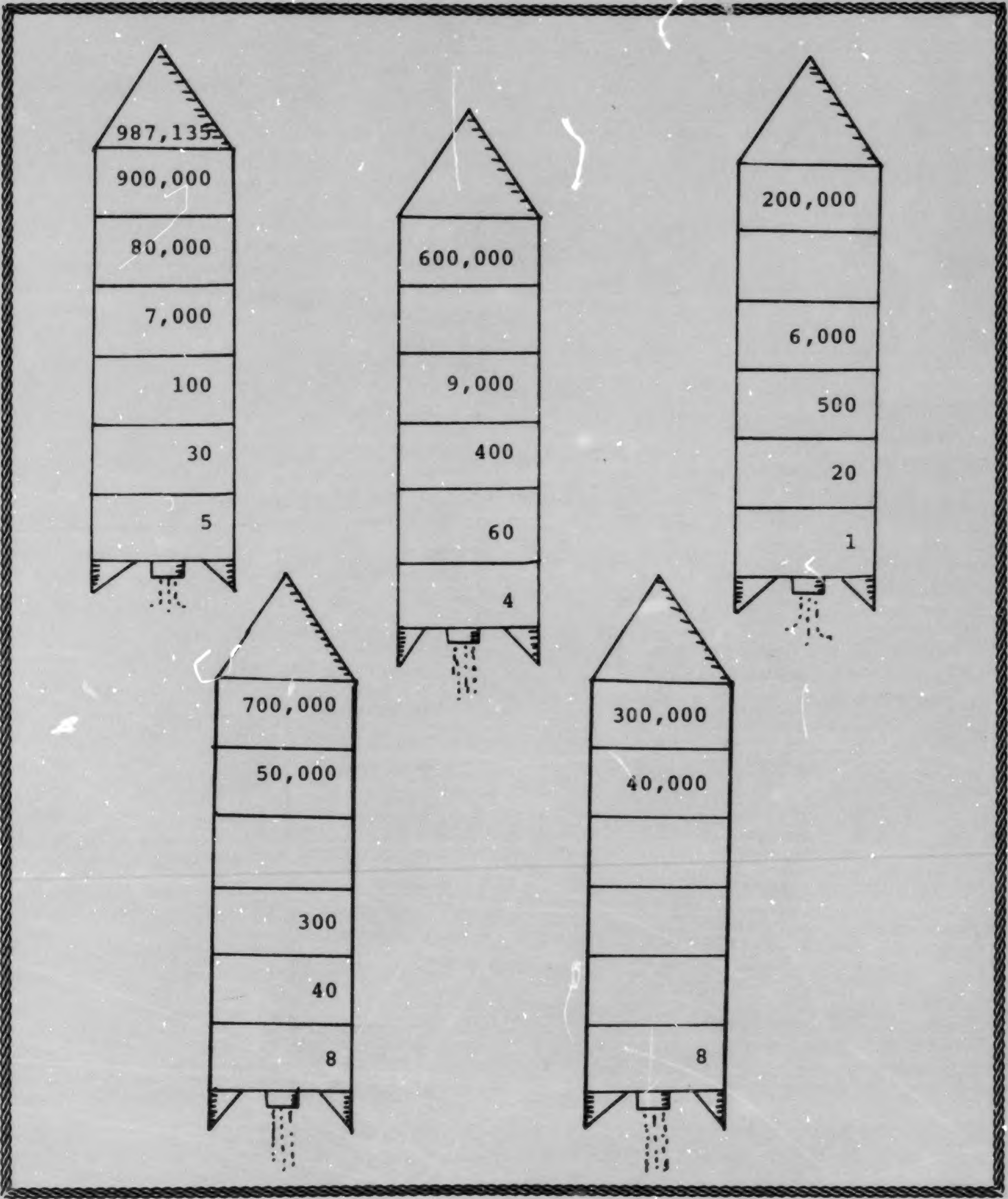
Directions: The body of each rocket shows a number in expanded form Add the number to reach the standard form. Write the standard numera in the nose cone of the rocket.


369,247
300,000
60,000
9,000
200
40
7
100,000
70,000
5,000
100
90
8
600,000
90,000
3,000
200
70
9
500,000
7,000
900
60
3
400,000
800
90
6

P.O. 6.14.01.03

NAME:____CLASS:_________DATE:_______

Directions: The body of each rocket shows a number in expanded form. Add the number to reach the standard form. Write the standard numeral in the nose cone of the rocket.


987,135
900,000
80,000
7,000
100
30
5
600,000
9,000
400
60
4
200,000
6,000
500
20
1
700,000
50,000
300
40
8
300,000
40,000
8

Unit 2

6.14.02 PROBLEM SOLVING - REVIEW

(3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.14.02.01A recognize and discard irrelevant information in word problems;

e.g.,

> There are 36 children in Mrs. Brown's sixth grade class. There were 8 students absent on Monday, and 5 students absent on Tuesday. What was the total attendance for Tuesday?

6.14.02.02A determine that there is insufficient information in a word problem;

e.g.,

> Mr. Hernandez traveled 23 miles on Thursday and 46 miles on Friday. How much further does he have to travel to reach San Francisco?

6.14.02.03A formulate word problems from given information.

e.g.,

Use numbers from the chart below to formulate a word problem whose answer is 26.

2	8	23	7
12	20	9	13
6	46	4	17

6.14.02

VOCABULARY

TERMS	SYMBOLS
extraneous	
insufficient	
data	

GETTING STARTED

Distribute worksheets to the students with instructions clearly printed in large type on the top of the page.

e.g., **READ EVERYTHING BEFORE ANSWERING QUESTIONS**

1. What is your name? ____________________
2. What is your teacher's name? _________
3. Add 364 + 1,275. ____________________
4. Subtract 987 - 386. ____________________
5. Multiply 38 x 43 ____________________
6. Write the odd numbers between 20 - 30.
   ____
7. How many balls would I have if I had 6 boxes with 3 balls in each box? ____
8. Don't answer any of the above questions except for question 1.

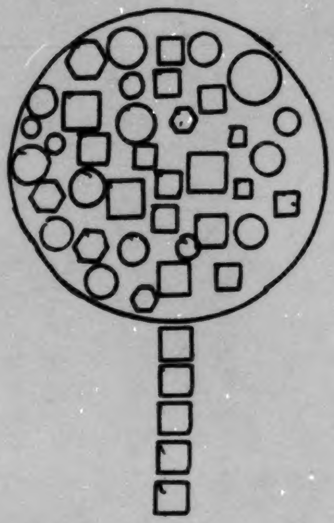
Say, "How much does this lollipop cost?

If

⬡ = 5¢

□ = 2¢

○ = 1¢



6.14.02

6.14.02.01 **recognize and disregard extraneous data in problem solving activities**

STRATEGY 1: Provide the students with a worksheet giving directions on how to perform a specific task with extraneous information dispersed thoughout.

e.g.,

How To Make Pudding

> Boil 2 cups (16 oz.) of water in a saucepan. Turn off the television set. Remove from the flame and pour into a mixing bowl. Answer the telephone. Add the contents of the package to the hot water. Stir with a spoon for one minute. Call the Weather Bureau. Set the table for five people using fancy napkins. Pour into a mold and chill in the refrigerator for about $1\frac{1}{2}$ hours until it is set.

Allow the students to read the worksheet. Instruct them to cross out all the information that does not directly relate to making the pudding.

STRATEGY 2: Provide a copy of the following worksheet for each child.

> On a sunny Thursday afternoon in July, Jane and John went for a walk in the woods. They decided to have a jumping race. The rule of the race was that the first person to jump from the starting point to the finish line 20 feet away and then back to the starting point would win the race. John jumped 24" every 5 seconds. His friend Jane jumped 20" every 3 seconds. Who won the race? (Jane)

STRATEGY 2: cont'd

After reading the problem, discuss the need for isolating the important information necessary for solving the problem.

Set up the following chart on the chalkboard.

Unimportant Information	Important Information
names of the children	John jumped 24" every 5 seconds
walking though the woods	Jane jumped 20" every 3 seconds
Jane and John are friends	must cross finish line 20 feet away and return
sunny day	What do we have to find out?

Collectively, solve the problem after discarding irrelevent information.

6.14.02.02 **determine that there is insufficient information in a word problem**

STRATEGY 1: Say, "I went to the store yesterday and I bought a new dress for $50.00 and a scarf for $5.00. How much change did I get?" Elicit from the students that they are unable to answer this problem because they do not know how much money you gave the clerk. Allow the students to supply the missing information that will enable them to solve the problem.

Repeat this procedure using several other word problems with insufficient information.

6.14.02

STRATEGY 2: Distribute worksheet 3b. Ask. "What is this picture about? Do you see anything missing in this picture?" Elicit from the students that the clock has no hands, the airplaine has only one wing, the car is missing a wheel and a front door, etc.

6.14.02.03 **formulate word problems from given information**

STRATEGY 1: Display the following on the chalkboard.

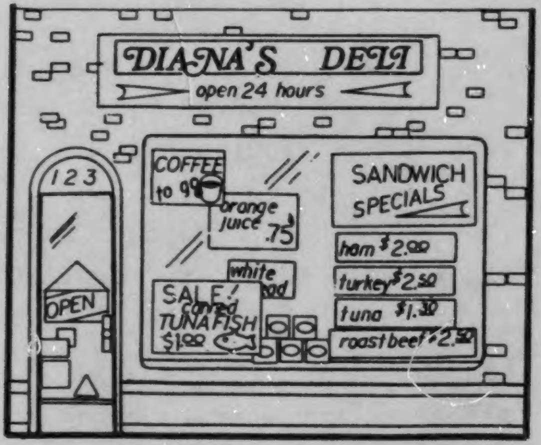
e.g.,

2	8	23	7	12	20
9	13	6	48	4	17

Say, "The answer is 26. Make up two different word problems using a combination of numbers from the chart. Any operation may be used."

STRATEGY 2: Cut out a picture from a magazine. Ask the students to make up a word problem based on information given in the picture.

e.g.,


DIANA'S DELI
open 24 hours
123
OPEN
COFFEE to 9¢
orange juice .75
white bread
SALE! canned TUNA FISH $1.00
SANDWICH SPECIALS
ham $2.00
turkey $2.50
tuna $1.30
roast beef $2.50

Ask, "How much would a tuna fish sandwich and a ham sandwich cost together?"

P.O. 6.14.02.01

NAME:____________________ CLASS:________ DATE:________

DIRECTIONS: Cross out irrelevant information. Solve the problem.

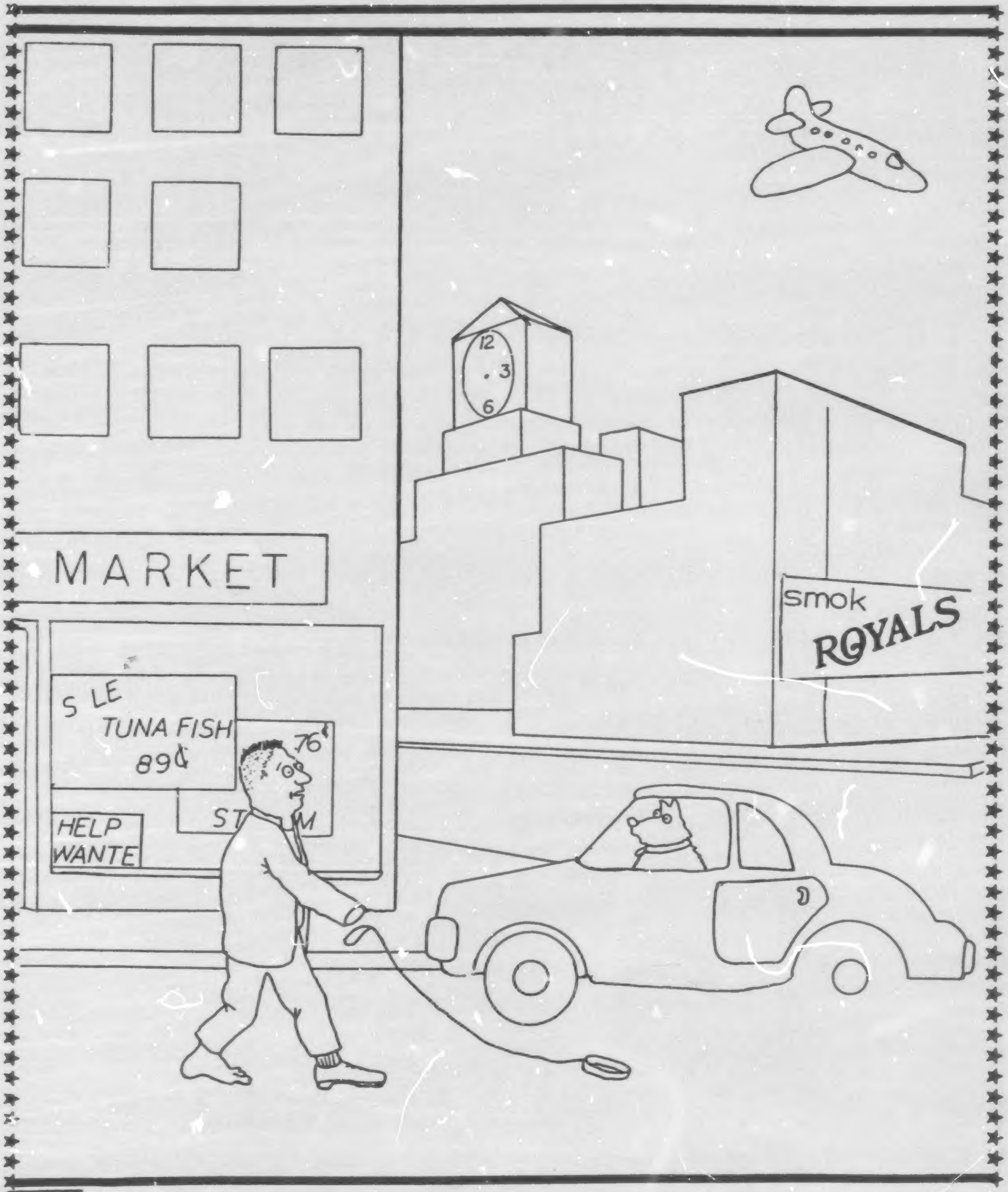
1. Susan Sportswear Shop buys tee-shirts from the Pri-tee Shirt factory. Susan ordered 126 blue, pink and yellow tee-shirts in sizes 8, 10, and 12. The shirts come in boxes of 6. How many boxes came to the store?

2. It was Carol's father's birthday. Carol and her friend went to Peepers store. Carol bought a scarf and gloves for her father which cost $12.95. Joyce bought a hat for $3.95. If the scarf cost $5.50, how much were the gloves?

P.O. 6.14.02.02

NAME:______________________________ CLASS:__________ DATE:________

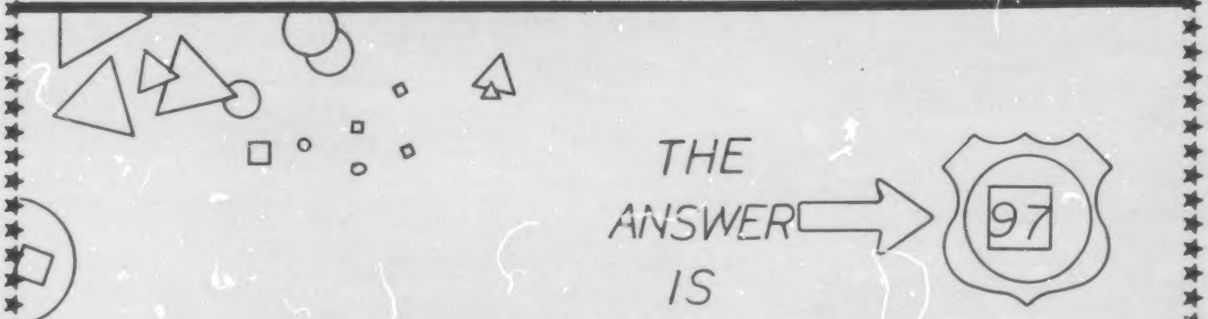
Directions: Complete this picture

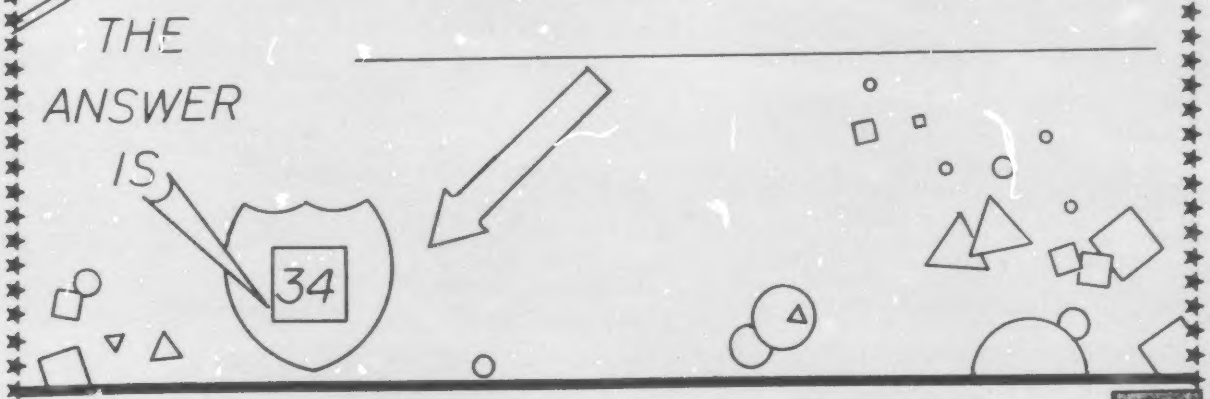

12
3
6
MARKET
smok
ROYALS
S LE
TUNA FISH
89¢
76¢
HELP
WANTE
ST M

P.O. 6.14.02.03

NAME: ____________________ CLASS: ________ DATE: ________

directions:
Write your own word problems.


THE
ANSWER
IS
97


THE
ANSWER
IS
34

Unit 3

6.01.01 READ, WRITE AND UNDERSTAND LARGE NUMBERS

(2-3 lessons)

PERFORMANCE OBJECTIVES

	The student will be able to...
6.01.01.01A	identify and write numbers through 10-digits in expanded notation; e.g., 8,436,118 = 8,000,000 + 400,000 + 30,000 + 6,000 + 100 + 10 + 8
6.01.01.02A	identify and write the standard numeral given the expanded form of numbers through 10-digits; e.g., 100,000,000 + 7,000,000 + 800,000 + 40,000 + 9,000 + 100 + 1 = 107,849,101
6.01.01.03A	rename a standard numeral in expanded notation using exponents; e.g., 674,371 = (6 x 100,000) + (7 x 10,000) + (4 x 1,000) + (3 x 100) + (7 x 10) + (1 x 1) - or - $= (6 \times 10^5) + (7 \times 10^4) + (4 \times 10^3) + (3 \times 10^2) + (7 \times 10^1) + (1 \times 1)$

6.01.01.04A compare two large numbers using the symbols <, >, =;

e.g.,

102,001,217 > 111,053,426
12,076,431 < 12,076,441
1,234,777 = 1,234,777

6.01.01.05A solve word problems related to skills learned in this module.

e.g.,

Plane A has 925,670,134 miles registered on its odometer. Plane B has 1,007,613,025 miles registered on its odometer. Which plane has traveled more miles?

1,007,613,025 > 925,670,134

Plane B has traveled more miles.

6.01.01

VOCABULARY

TERMS	SYMBOLS
comparisons	
equal to	=
greater than	>
less than	<
place value	
digit	
million	
expanded notation	
exponential notation	
standard numeral	
inequality	
multiple choice	

GETTING STARTED

Construct a place value chart with seven columns and seven sets of cards. Each set has ten cards, each numbered with a single digit 0 through 9. A student selects one card for each column that he/she wishes to fill. Ask the student to begin with the ones column and work left. Use tape to hold each card in place. Elicit the standard numeral represented on the chart. The student who reads it correctly is the next student to construct any numeral through the hundred thousands place.

Additional practice can be provided using individual student place value charts.

GETTING STARTED cont'd

	Millions			Thousands			Units		
	hundreds	tens	ones	hundreds	tens	ones	hundreds	tens	ones
A.									
B.									
C.									
D.									
E.									
F.									
G.									
H.									
I.									

Place Value Draw

Construct a game board on a 10" x 12" piece of oaktag. Mark boxes for each of seven digit places. Also mark places in the center of the board for a deck of digit cards, for a deck of place value word cards, and for a discard pile. Cover the board with transparent contact paper so that it will be resistant to wear.

Use 2" x 3" index cards to make at least one set of ten digit cards (numbered 0 through 9) and one set of place value word cards (seven cards through "millions," preferably color-coded) for each player.

One student draws a card from each of the two decks. The student places these cards on the game board. The student places the digit card (right to left) on his/her space according to the place value card drawn.

Each student gets a chance to turn over two cards (one card from each deck), but loses a turn if the place is already filled. The game ends when one student has filled his/her digit places on the board.

6.01.01

6.01.01.01 **identify and write numbers through 10-digits in expanded notation**

STRATEGY 1: Copy this list showing New York State Lottery winnings on the chalkboard.

e.g.,

1st Prize: $5,863,438
2nd Prize: $3,576,205
3rd Prize: $ 898,367
4th Prize: $ 47,215
5th Prize: $ 6,023
6th Prize: $ 278

Construct a place value chart on the chalkboard.

Billions	Millions			Thousands			Units		
billions	hundred millions	ten millions	millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones
			5	8	6	3	4	3	8
			3	5	7	6	2	0	5

Ask, "Who will come to the chalkboard and record the first prize winnings on the place value chart? Read the amount you have recorded. Write this amount in its expanded notation."

e.g.,

$5,863,438 = $5,000,000 + $800,000 + 60,000
+ 3,000 + 400 + 30 + 8

Continue this procedure until all the prizes have been recorded on the place value chart.

Say, "Make 2 columns in notebook. We are going to rename each prize amount in expanded notation. Write the first prize amount in the first column, the expanded notation for that amount in the second column."

STRATEGY 1: cont'd

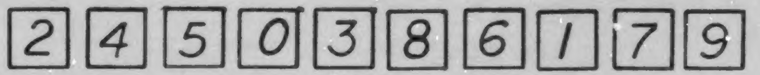
e.g.,

47215 = (4 X 10,000)+(7 X 1,000) + (2 X 100)+(1 X 10)+(5 X 1)

Continue this procedure, until all the prize amounts have been noted.

STRATEGY 2: Distribute approximately 30 unit squares to each student. Instruct the students to write a different digit (0-9) on each small square. Have the students write 0 on ten of the squares. Say, "We are going to play a game called Expanded Notation. I am going to show you a number on a flashcard. As quickly as you can, move your place value pieces to form the number on the flashcard. When you are finished, place both of your hands behind your chair." Display the first flashcard, e.g., 386,179. Wait until students have moved their place value pieces to form the numeral.

Ask these questions in random order, "Who can read this numeral? How many ten thousands do we have? (8) How many hundred thousands do we have?" (3), etc.



STRATEGY 2: cont'd

When finished with the first flashcard, say, "Move your place value pieces back to the starting position (nine vertical rows from 1,000,000 through 1.)"

Repeat this procedure, using other large numerals.

6.01.01.02 identify and write the place value of large numbers

STRATEGY 1:

Using index cards, make a deck of ten cards labeled 0 through 9. Place the deck on a table. Say, "Draw a card from the deck and place it face upwards on the table." Cards should be placed from right to left. As each card is turned and placed to the left of the first card, the student reads the combined numbers and gives its expanded form. e.g.,

card 3	card 2	card 1
4	5	2

		Expanded Form
First student:	2	
Second student:	52	50+2
Third student:	452	400+50+2

Continue building the number.

Fourth student:	3,452	3,000+400+50+2
Fifth student:	63,452	60,000+3,000+400+50+2
Sixth student:	763,452	etc.
Seventh student:	8,763,452	
Eight student:	18,763,452	
Ninth student:	918,763,452	

Repeat this procedure several times after shuffling the number cards.

STRATEGY 2: Ask seven students to form a straight line in front of the room. Each student selects a number card and holds it up against his/her chest.

On the chalkboard behind the students, write a place value in order (moving from right to left). Call out a place value for the number displayed, e.g., "hundreds" (2,841,793). The student in the hundreds place holding the number seven card will step forward and write his/her number on the chalkboard, e.g., 700. Continue the above procedure, calling out other place values. When a student answers correctly, he/she writes his/her numeral on the chalkboard. Direct the students to write numbers one under the other, keeping the columns straight.

e.g.,

```
      700
        3
2,000,000
  800,000
    1,000
       90
  +40,000
---------
2,841,793
```

When the students have completed all seven numbers, ask a student to add the numbers on the chalkboard. Ask another student to read the sum to the class to check that it matches the original number.

Repeat this procedure, after shuffling the cards, until all of the students in the room have had a chance to participate.

6.01.01

6.01.01.03 **rename a standard numeral in expanded notation using exponents**

STRATEGY 1: Ask the students to write 800 in expanded notation.
e.g.,

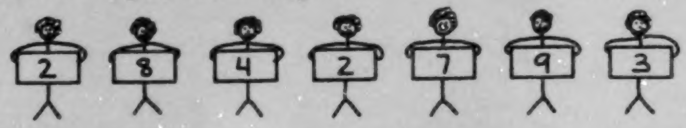
$800 = 8 \times 100$

Ask, "What is another way to write 100?" (10^2) Explain that $8 \times 100 = 8 \times 10 \times 10 = 8 \times 10^2$. Ask students to write each of the following numbers using expanded and exponential notation.
e.g.,

$7{,}000 = 7 \times 1{,}000 = 7 \times 10^3$
$50{,}000 = 5 \times 10{,}000 = 5 \times 10^4$
$200{,}000 = 2 \times 100{,}000 = 2 \times 10^5$
$6{,}000{,}000 = 6 \times 1{,}000{,}000 = 6 \times 10^6$
$90{,}000{,}000 = 9 \times 10{,}000{,}000 = 9 \times 10^7$
$300{,}000{,}000 = 3 \times 100{,}000{,}000 = 3 \times 10^8$
$4{,}000{,}000{,}000 = 4 \times 1{,}000{,}000{,}000 = 4 \times 10^9$

Ask, "What number would you get if you added the expanded notation column?" (4,396,257,800) Explain that this number may be written in exponential notation as:
$(4 \times 10^9)+(3 \times 10^8)+(9 \times 10^7)+(6 \times 10^6)+(2 \times 10^5)+$
$(5 \times 10^4)+(7 \times 10^3)+(8 \times 10^2)$.

Ask seven students to form a straight line in front of the room. Each student selects a number card and holds it up chest high.
e.g.,



Ask another seven students to form a straight line next to the original line formed. Hand each of these students one exponent card.

6.01.01

STRATEGY 1: cont'd

e.g.,

$\boxed{1}\ \boxed{10^1}\ \boxed{10^2}\ \boxed{10^3}\ \boxed{10^4}\ \boxed{10^5}\ \boxed{10^6}\ \boxed{10^7}$

As each card is distributed, ask the class for the meaning of each card.

e.g.,

$10^2 = 100$

Call out a place value, e.g., hundreds. The student holding the card in the hundreds place (7) should step forward and write the number on the chalkboard (700). Ask, "Which exponent, when multiplied by 7, would equal 700?" (10^2) Ask the student with the correct exponent card to join the student with the number 7 card. Proceed in this manner to match each digit with the corresponding exponent.

STRATEGY 2: Display a place value chart, through one billion on a large sheet of oaktag. Ask students to write the numerical value of each place.

e.g.,

Billions	Millions			Thousands			Units		
O	H	T	O	H	T	O	H	T	O
1,000,000,000	100,000,000	10,000,000	1,000,000	100,000	10,000	1,000	100	10	1

Say, "How can we express 100 in another way?" ($100 = 10^2$) Write 10^2 under the 100 on the chart.

Ask students to write each place value as a power of ten in the place value chart.

e.g.,

$100{,}000 = 1 \times 10^5$

Ask students to write 6,237,125,986 in expanded form using powers of ten. Ask them to refer to the place value chart.

6.01.01

STRATEGY 2: cont'd

e.g.,

$$6{,}237{,}125{,}986 = (6 \times 10^9)+(2 \times 10^8)+(3 \times 10^7)+(7 \times 10^6)+(1 \times 10^5)+(2 \times 10^4)+(5 \times 10^3)+(9 \times 10^2)+(8 \times 10^1)+(6 \times 1)$$

6.01.01.04 **compare two large numbers using the symbols <, >, and =**

STRATEGY 1: Construct a class set of index cards, each having a 6- or 7-digit number written on it. Distribute these cards.

Write a greater than (>) or less than (<) symbol on the chalkboard.

Ask, "Who can read the number on their card." A student reads his/her number. He/she goes to the chalkboard and tapes the number card to the left of the symbol.

e.g., 699,675 >

Say, "If you have a number card which solves the inequality, please stand near your seat and hold your card out in front of you." Some students read the statement aloud, using the number on their card.

e.g.,

Student 1: 699,675 > 691,226

Student 2: 699,675 > 546,129

Limit responses to no more than five students for each inequality.

Repeat this procedure, alternating the greater than (>) and less than (<) symbols.

STRATEGY 2: Write a large number on the chalkboard. Write the greater than symbol (>) after the number. Then write three large numbers on the chalkboard - one which is less than, one which is equal to, and one which is greater than the original number.

e.g.,

723,451 >

(a) 713,451 (b) 723,451 (c) 723,551

Ask, "Which number is greater than 723,451? Is it (a) 713,451 (b) 723,451 or (c) 723,551?" Students should respond (a) 723,551

Repeat this procedure, comparing other large numbers. This procedure can be used to illustrate the (>), (<) and (=) symbols.

Note: Be sure to vary the position of the numbers in multiple choice.

e.g.,

432,145 <

(a) 401,637 (b) 442,146 (c) 432,145

598,654 =

(a) 598,654 (b) 698,379 (c) 432,117

Number Mixup

Write a 6-digit number on the chalkboard, with the greater than (>) symbol before the number.

e.g.,

> 549,683

Ask a student to and write a number that is greater than 549,683, using the same digits found in 549,683.

e.g.,

594,683

654,983

836,549

Repeat the above procedure using the less than (<) symbol and 7-digit numbers.

6.01.01

6.01.01.05 **solve word problems related to skills learned in this module**

STRATEGY 1: Write the following chart on the chalkboard or on a duplicating master.

Planet	Average Distance from the Sun (miles)	Numeral in Expanded Notation
Uranus	1,782,227,700	
Mars	141,568,700	
Pluto	3,671,660,400	
Jupiter	483,401,300	
Earth	92,912,000	
Saturn	886,270,100	
Neptune	2,792,717,000	
Venus	67,206,000	
Mercury	36,059,000	

Ask several students to read the average distance from the sun of the planets in our solar system. Ask the students to write each distance in expanded notation in the third column of the chart. Say, "Using one of these symbols (<), (>), or (=), compare the distances from the sun for each of the following planets." Write the following list on the chalkboard, under the chart, or on a duplicating master.

e.g.,

Neptune and Mars e.g., 2,792,717,000 > 141,568,700
Uranus and Pluto ________________
Saturn and Neptune ________________
Earth and Venus ________________
Mercury and Jupiter ________________
Neptune and Earth ________________
Mercury and Venus ________________
Pluto and Neptune ________________
Mars and Uranus ________________
Saturn and Jupiter ________________

Ask the students to complete the chart independently. Review the answers with the class.

STRATEGY 2: Write individual problems on a newsprint chart for each student to solve. Tape the newsprint chart to the chalkboard and provide each student with a marker. Ask the students to solve their problems. After sufficient time has been given for problem completion, ask each student to read his/her problem aloud and discuss it.

The following are a sample of the problems you could use.

(1.) The annual income of M ° R Co. last year was reported at $910,798,249. The annual income of XYZ was reported at $901,897,310.

- a) Which is the more successful company.
- b) Write a number sentence comparing the two numerals.

(2.) The Delta River Oil Company produced 2,865,349,381 barrels of oil in 1973, 2,417,566,140 barrels in 1974, and 2,663,178,221 barrels in 1975.

- a) In which year did they produce the largest amount of oil.
- b) Write a number sentence comparing oil production in 1974 and 1975.
- c) Write a number sentence comparing oil production in 1973 and 1975.

(3.) Central Airlines flew a total of 1,469,641,708 miles in 1979; 1,649,146,800 miles in 1980, and 1,545,917,224 miles in 1981.

- a) Write a number sentence comparing the mileage in 1980 and 1981.
- b) Write a number sentence comparing the mileage in 1979 and 1981.
- c) Write a number sentence comparing the mileage in 1979 and 1980.

STRATEGY 2:
cont'd

Helpful Hints:

The following ideas may be of help in creating your own problem worksheets involving large 9- and 10-digit numbers.

Much of the data can be found in either an encyclopedia or an almanac.

1. Populations of major countries.
2. Distances of the planets in our solar system from the sun and from each other.
3. Number of specific items sold at "fast food" restaurants.
4. Number of specific stamps sold at a post office.
5. Distances flown by astronauts.
6. Yearly attendance at sports events.
7. The number of people going to a beach during the summer months.

P.O. 6.01.01.01

NAME:____________________________________CLASS:________DATE:______

Directions: Write in expanded notation.

a) 810 = ____

b) 10,556 = ____

c) 56,101 = ____

d) 113,543 = ____

e) 68 = ____

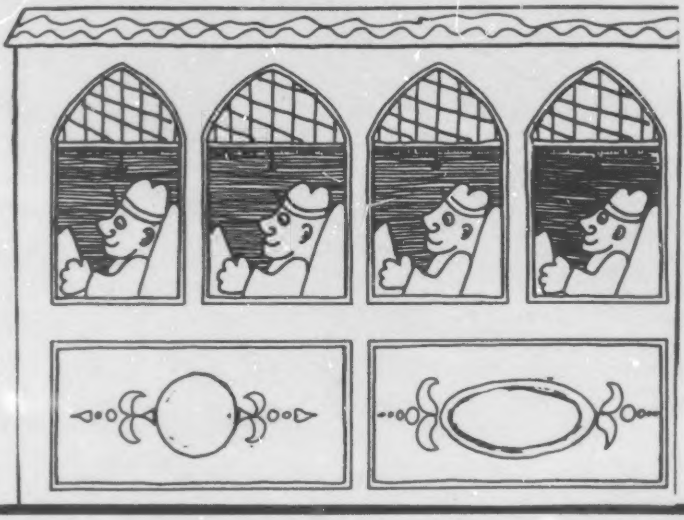
f) 9,875 = ____

g) 10 = ____

h) 476,000 = ____

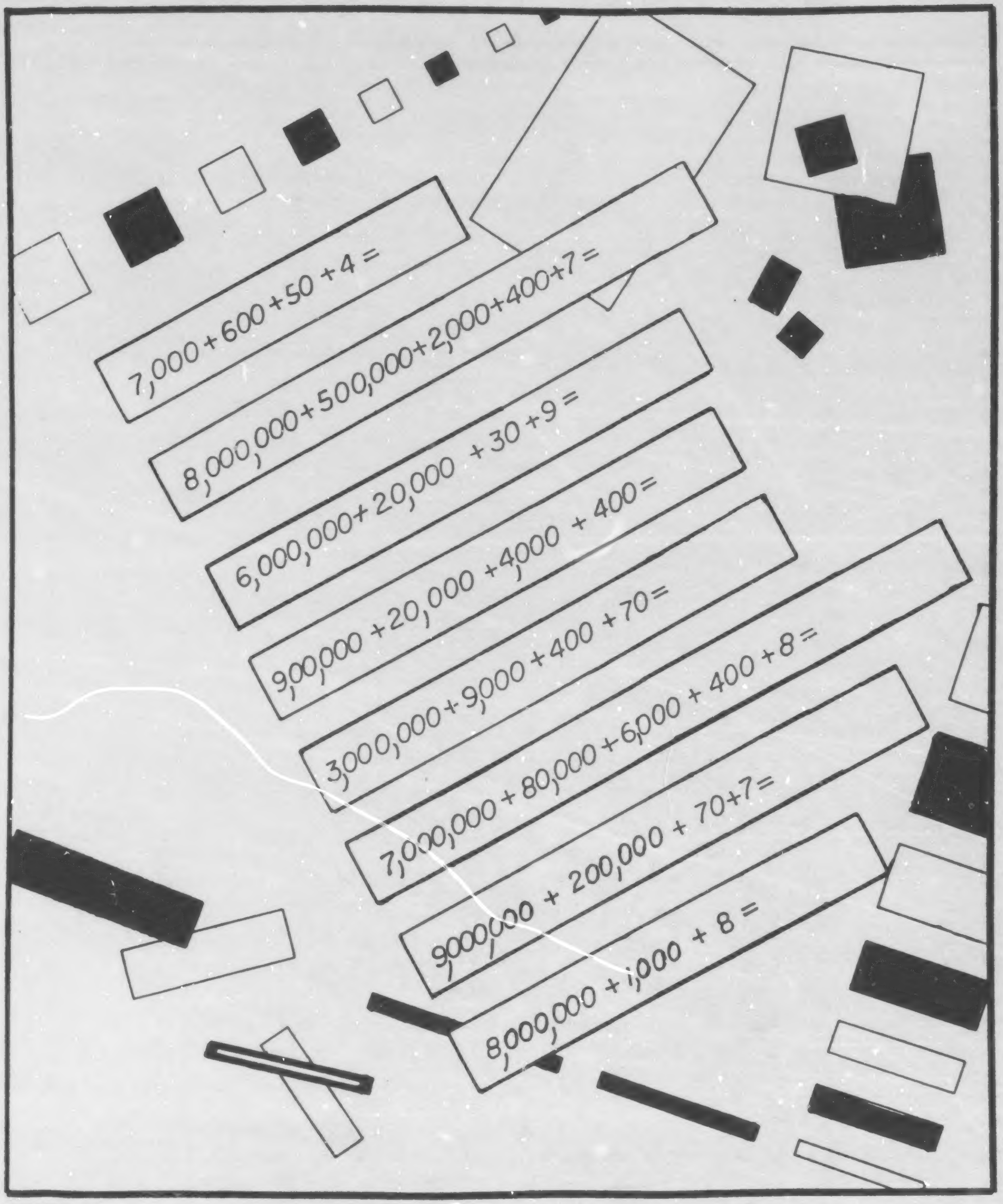
i) 536 = ____

j) 1,700,565 = ____



P.O. 6.01.01.02

NAME: ______________________________ CLASS: __________ DATE: ________



7,000 + 600 + 50 + 4 =

8,000,000 + 500,000 + 2,000 + 400 + 7 =

6,000,000 + 20,000 + 30 + 9 =

9,00,000 + 20,000 + 4,000 + 400 =

3,000,000 + 9,000 + 400 + 70 =

7,000,000 + 80,000 + 6,000 + 400 + 8 =

9000,000 + 200,000 + 70 + 7 =

8,000,000 + 1,000 + 8 =

P.O. 6.01.01.03

NAME: ________________________ CLASS: ________ DATE: ________

I. Write each of the following examples by using an exponent.

II. Complete each number sentence.

I. Example: $5{,}000 = 5 \times 10^3$

a) 8,000,000 = ____________________

b) 700,000 = ____________________

c) 6,000,000,000 = ____________________

d) 50,000 = ____________________

e) 4,000 = ____________________

II.

a) $29{,}853 = 2 \times 10^4 + 9 \times 10^3 + 8 \times \boxed{} + 5 \times \boxed{} + 3 \times 1$

b) $6{,}250{,}315 = 6 \times \boxed{} + 2 \times 10^5 + 5 \times \boxed{} + 3 \times 10^2 + 1 \times \boxed{} + 5 \times 1$

c) $236{,}519{,}800 = 2 \times \boxed{} + 3 \times 10^7 + 6 \times \boxed{} + 5 \times 10^5 + 1 \times \boxed{} + 9 \times 10^3 + 8 \times \boxed{}$

d) $5{,}827{,}956{,}283 = 5 \times \boxed{} + 8 \times 10^8 + 2 \times \boxed{} + 7 \times \boxed{} + 9 \times \boxed{} + 5 \times \boxed{} + 6 \times \boxed{} + 2 \times \boxed{} + 8 \times 10^1 + 3 \times 1$

P.O. 6.01.01.04

NAME: ____________________ CLASS: ________ DATE: ________

Directions: Circle the larger number. Write the letter that goes with the greater number in the box.

Who is the piano player in the Peanuts comic strip?

(1) 28,634 G   28,732 S

(2) 488,183 C   487,997 Q

(3) 675,299 H   675,030 M

(4) 27,296 K   27,408 R

(5) 58,835 O   56,067 U

(6) 75,832,009 F   79,100,000 E

(7) 267,113,999 B   267,311,999 D

(8) 73,800,952 E   67,999,112 M

(9) 25,000,000 R   22,999,999 P

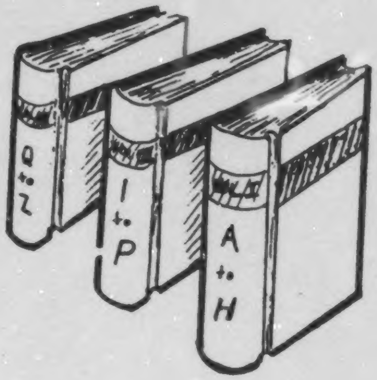
1	2	3	4	5	6	7	8	9

P.O. 6.01.01.05

NAME:________________________________CLASS:__________DATE:________

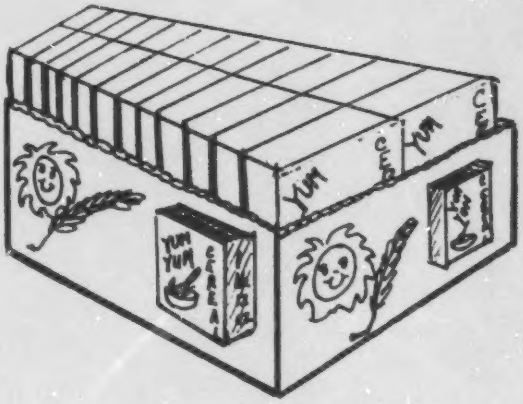
I.

A dictionary consist of three (3) separate volumes. Volume I contains 23,506 words. Volume II contains 22,379 words and volume III contains 22,568 words. Which volume contains the most words?



II.

A case of Yum Yum cereal weighs 12,642 grams. A case of Fun cereal weighs 12,462 grams. Which case is lighter?



6.14.03 GRAPHS

(ongoing)

PERFORMANCE OBJECTIVES

The student will be able to...

6.14.03.01 make frequency tables from tallied data; e.g.,

The frequency of a letter appearing when spinning a spinner 35 times.

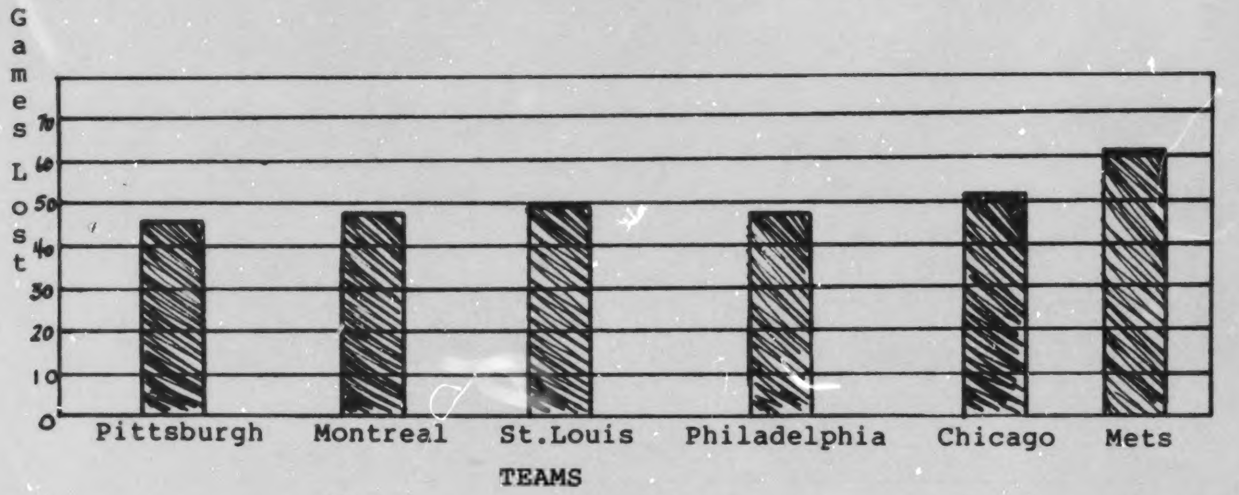
Letter	Tally	Frequency
A	𝍸 |	6
B	𝍸 𝍸 ||	12
C	𝍸 ||||	9
D	||	2
E	|	1
F	𝍸	5

6.14.03.02 graph data drawn from newspaper; e.g.,

NATIONAL LEAGUE
EAST DIVISION

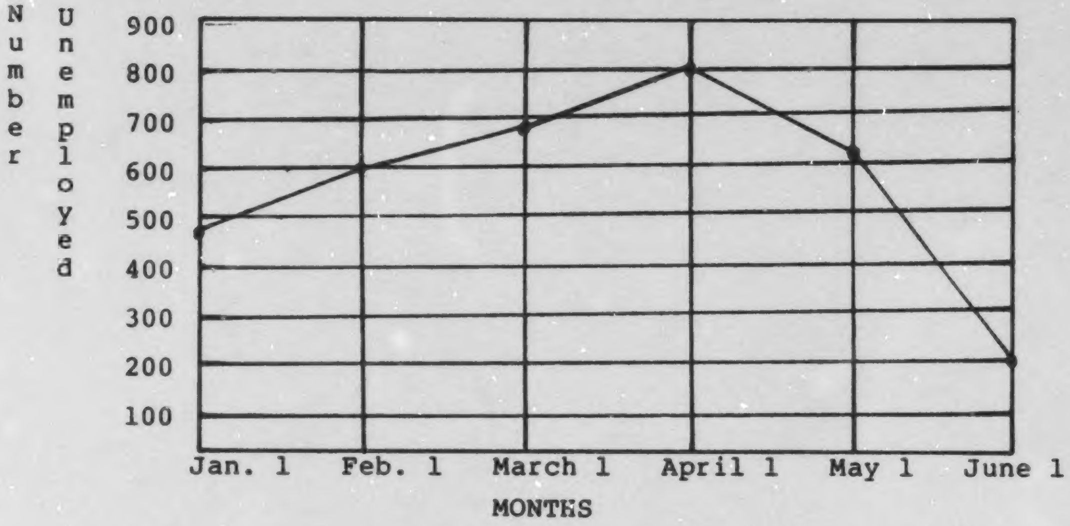
	W	L	Pct.	GB
Pittsburgh	49	46	.516	
Montreal	48	47	.505	1
St. Louis	48	48	.500	1 $\frac{1}{2}$
Philadelphia	45	47	.489	2 $\frac{1}{2}$
Chicago	45	52	.464	5
Mets	36	61	.371	14

NATIONAL LEAGUE BASEBALL SCORE CHART



6.14.03.03 read and interpret information from a line graph; e.g.,

BROOKLYN UNEMPLOYMENT FOR FIRST SIX MONTHS OF 1981



Unemployment in 1981	
Jan. 1	475 people
Feb. 1	600 people
March 1	680 people
April 1	800 people
May 1	625 people
June 1	200 people

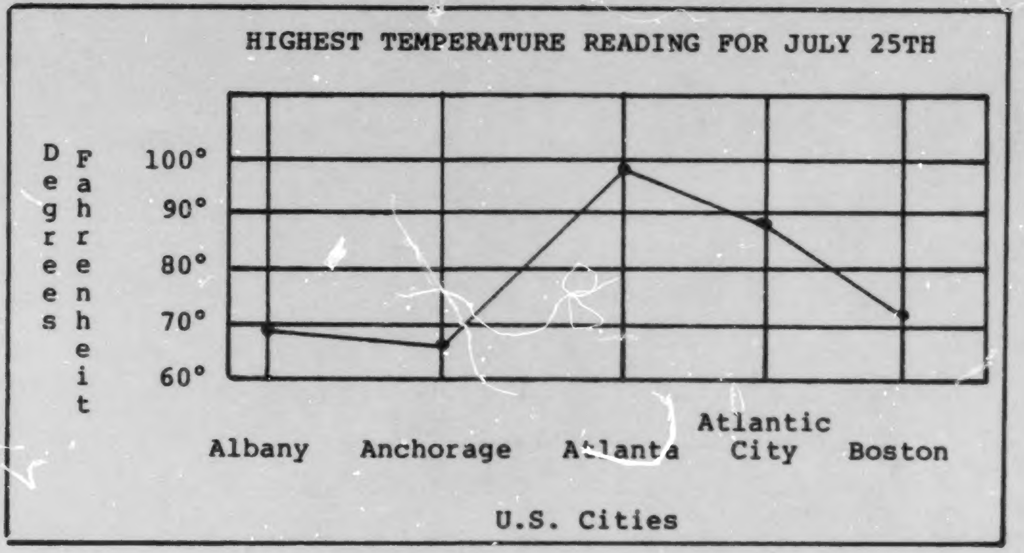
47

6.14.03.04 construct a line graph.

e.g.,

Obtain weather reports from newspapers. Graph temperature readings of the first five U.S. cities.

U.S. Cities Forecast	Temp.
Albany	69
Anchorage	67
Atlanta	98
Atlantic City	88
Boston	72



6.14.03

VOCABULARY

TERMS

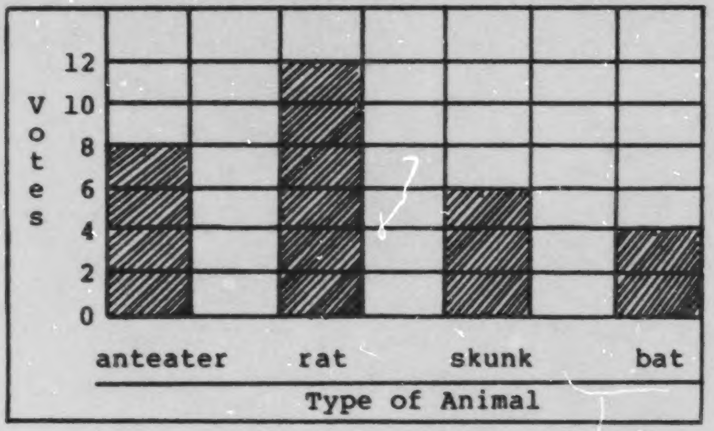
tally sheet
data
bar graph
line graph
frequency table
scales

GETTING STARTED

Ask, "What is the ugliest animal in the world?" Survey the responses and tally the answers. Draw a bar graph to illustate the choices.

e.g.,

The Ugliest Animals



Ask, "What should be the title of this bar graph?" (The Ugliest Animals.) Ask, "What should be the label for each scale?" (Votes and Type of Animal.) Ask, "What does the height of the bar show?" (The height of the bar gives the information about the items on the graph.)

Ask six students to measure their heights in and make a bar graph for the class. The rest of the class can draw the same graph on graph paper at their seats.

GETTING STARTED cont'd

Ask, "What information is needed?" Elicit that we need the name and height of each student. Have children place names on horizontal axis. Find range of height of children being measured. Determine measurement intervals, place on metrical axis. Children will fill in bar graph. Have children interpret and read bar graph (who is the tallest, are any students the same height), etc.

6.14.03

6.14.03.01 make frequency tables from tallied data

STRATEGY 1: Ask, "What is your favorite fruit?" Designate a student to come to the chalkboard and keep a tally of how the class votes.

e.g.,

Peaches	Oranges	Pears	Grapes	Bananas	Apples	Berries
𝍷𝍷𝍷𝍷	𝍸 𝍷𝍷	𝍷𝍷	𝍸 𝍷	𝍸 𝍷𝍷𝍷𝍷	𝍷𝍷𝍷	𝍸 𝍷

Say, "Make a frequency table in your notebooks." Ask, "What should you include?" Elicit that there should be a title to tell what the data is about.

e.g.,

Mr. Compote's Class Survey of Favorite Fruits

Peaches	Oranges	Pears	Grapes	Bananas	Apples	Berries
4	7	2	6	9	3	6

Ask, "Which fruit is most popular? Which fruit is least popular?" The students should list the fruits in order of preference, from the most popular to the least popular.

STRATEGY 2: Divide the class into 2 teams. Give each team a survey-type question. e.g., "What is your average bedtime?" "What is the latest you have ever gone to sleep?" "What is your favorite food at Burger King?" "What's your favorite color?" What's your favorite T.V. program?"

STRATEGY 2: cont'd

Allow ten minutes for the students to tally their classmates' answers and make a frequency table. Direct each group to label their frequency table.

The captain of each team will report the results to the class.

6.14.03.02 graph data drawn from newspapers

STRATEGY 1:

Ask the class to read the sports page every day for a week. Add the total runs scored daily by all the winning and losing teams for both the American and National Leagues.

Ask the students to find the difference in runs scored for each day. e.g., The 7 winning teams in the American League scored 62 runs while the 7 losing teams scored only 27 in one day. The difference is 35.

At the end of the week, ask the students to present a line graph of the results.

STRATEGY 2:

Ask each student to pick three cities from the "Foreign and U.S. Cities" section on the Weather Forecast page. Say, "You will keep a record of the daily temperature each day in each city. At the end of the week you will present 3 line graphs to illustrate your results."

6.14.03

6.14.03.03 **read and interpret information from a line graph**

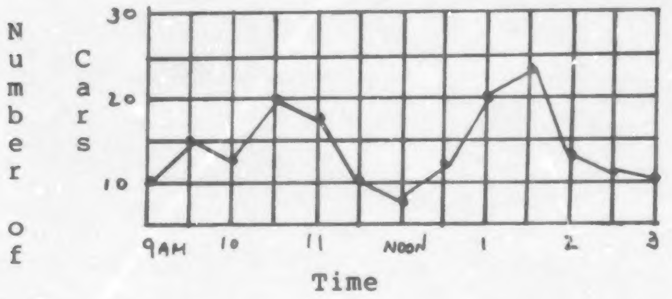
STRATEGY 1: Say, "The line graph allows data to be gathered in an orderly manner."

Ask, "If a stop light was being considered for a certain intersection, how could traffic personnel use a line graph to check traffic?" (The graph can give a clear picture of the number of cars which pass through the intersection, at different times of the day.)

Present this line graph.

e.g.,

CARS GOING THROUGH INTERSECTION



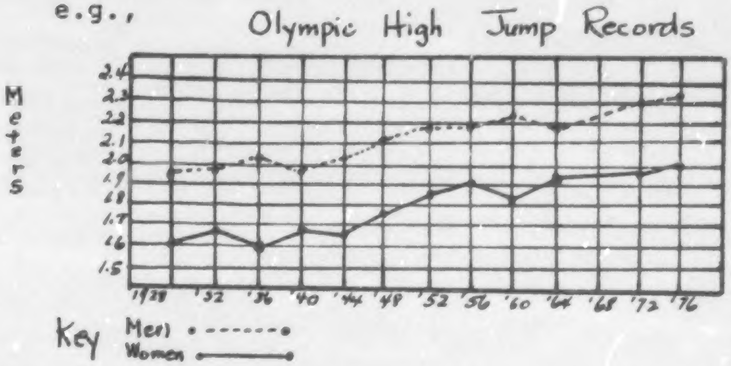
Say, "Each part of the line graph has a purpose." Ask, "Who can explain the purpose of the title horizontal axis, vertical axis?" (The title tells what the line graph is about; the vertical axis tells us the number of cars; horizontal tells the time of the day.

Ask, "What is the busiest time of the day at the intersection. (1:30) "What is the time of day when there are the fewest cars crossing the intersection."

STRATEGY 1: cont'd (Noon) "How many cars pass the intersection at 9 AM?" (10) What time did 20 cars go through the intersection? (1:00 P.M.)

STRATEGY 2: Prepare a line graph on construction paper chart like the one below for use in this game.

e.g.,



Prepare a deck of 22 cards with questions such as, "What was the men's winning jump in '64?" (2.18 meters) "What was the women's winning jump in '64?" (1.90 meters). These cards are worth one point each.

Prepare a deck of eleven cards with questions such as, "In what year was the men's winning jump?" Fill in the winning numbers from the graph for men. These cards are worth two points each.

Make a deck of ten cards (1928 and 1936 had the same 1.6 winning number) asking, "In what year was the women's winning number?" Fill in the ten winning numbers for the women. These cards are worth two points each.

Prepare another set of cards with three point questions such as, "In which years did the men's (women's) record show a decrease?" "In which years did the women's record show the greatest decrease?" "How much has the men's (women's) record increased by from 1928 to 1976?"

6.14.03

STRATEGY 2: cont'd

Divide the class into two teams. Ask students to pick a card and answer the question. If his/her answer is correct, the team scores that many points. If not, the other team gets a chance to "steal" the question. Teams take turns answering questions until one team has scored thirty points, or until all the questions have been answered (in which case the team with the most points wins).

Use three different colored sets of index cards; for example, blue for one-point questions, yellow for two-point questions and green for three-point questions.

6.14.03.04 **construct a line graph**

STRATEGY 1: Write the following table on the chalkboard:

Women's Olympic 100-Meter Run

Year	Winning Time
1948	11.8 sec.
1952	11.5 sec.
1956	11.4 sec.
1960	11.0 sec.
1964	11.4 sec.
1968	11.0 sec.
1972	11.1 sec.
1976	11.0 sec.

Say, "Make a line graph to show these facts." Distribute graph paper.

Ask, "What are the time intervals that must be put on the graph?" Elicit 11:0 - 11:8. Student should place years on horizontal axis.

6.14.03

STRATEGY 1:
cont'd

Let one line on the graph paper equals one year. Time should be placed on vertical axis. 1:10 of a second should equal 1 line on the graph. The graph should start at 10.8 of a second and go up to 11.9 of a second.

Make sure that the students label their graphs, naming the horizontal and vertical axis.

Ask, "What does the horizontal scale indicate?" (The horizontal scale indicates a "year value" and the vertical scale indicates a "time value".)

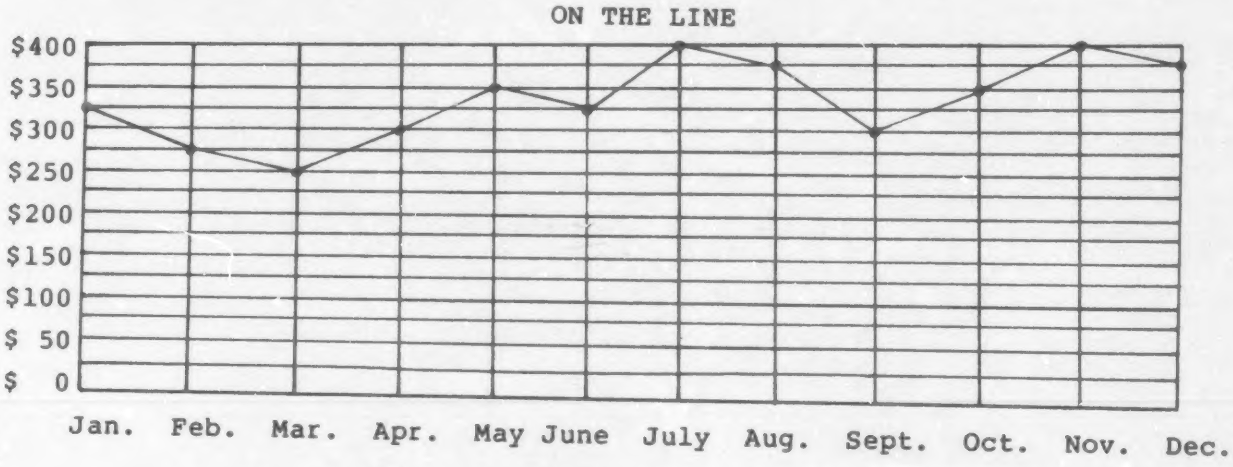
Ask the students to plot the points for each of the pairs of values from the table, connecting the points with straight lines.

Ask, "Did everyone title their graph? What is your title?" (Women's Olympic 100-Meter Run.)

STRATEGY 2:

Display graph to class. Elicit name of graph. Discuss information on horizontal and vertical axis.

The graph below shows Donna's income for the year.



Have children use the graph to answer the following questions.

1. In which months did Donna have the highest income?

____

2. In which months did Donna have the lowest income?

____

6.14.03

STRATEGY 2: cont'd

3. How much income did Donna have in May? ____
4. Have children formulate their own questions based on line graph.

P.O. 6.14.03.01

NAME: ______________________ CLASS: ________ DATE: ________

When asked, "What in the world frightens you the most?", people responded as follows:

The dark	𝍸 |||
Strange dogs	𝍸 𝍸 𝍸 ||
Flying in a plane	𝍸 𝍸 𝍸 𝍸 𝍸 |||
Swimming	𝍸 ||
Snakes	𝍸 𝍸 𝍸 ||
Bugs/Insects	𝍸 𝍸 |||
Heights	𝍸 𝍸
Crowds	𝍸 ||
Ghosts	|||

Make a frequency table for these items. Write them in order from the most scary to the least scary.

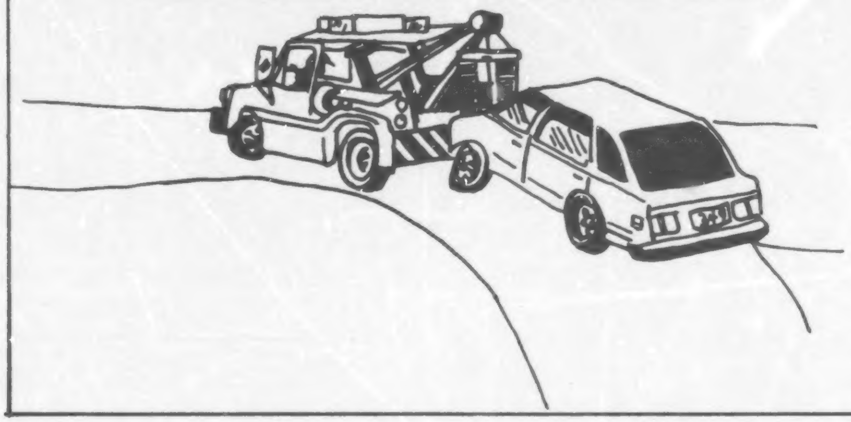
P.O. 6.14.03.02

NAME: ______________________ CLASS; ________ DATE: ________

Traffic deaths

Traffic deaths for the first three months of 1983. Here's a four-year comparison:

	1980	1981	1982	1983
January	3,650	3,840	3,100	3,260
February	3,440	3,570	2,890	2,940
March	3,810	3,780	3,430	3,170
Total	10,900	11,190	9,420	9,370



Use the above chart* to draw 4 line graphs on the next page. Draw your graphs in four different colors. Graph the traffic deaths for January, February, and March for each of the 4 years 1980, 1981, 1982 and 1983.

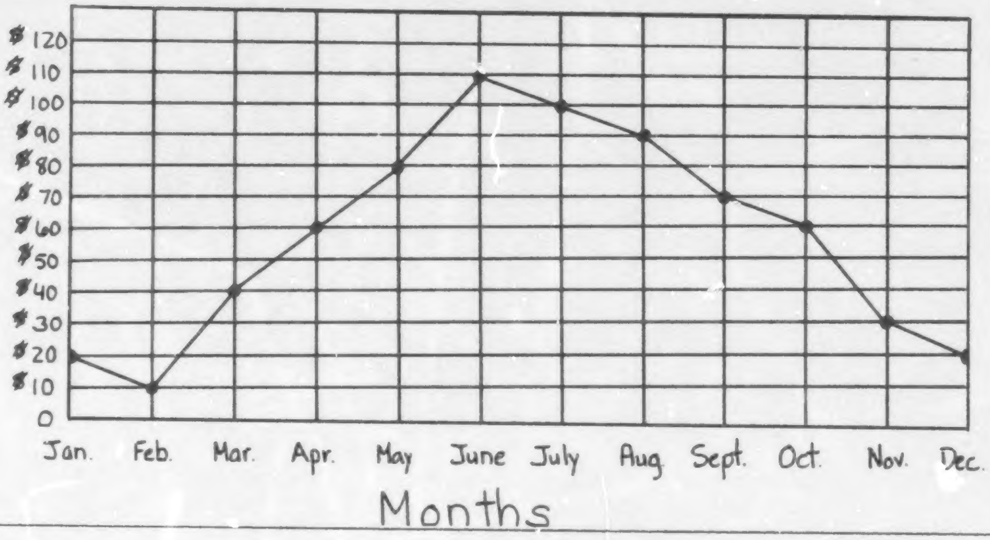
*USA Today by John Sherlock.

P.O. 6.14.03.03

NAME:____CLASS:__________DATE:_______

Directions: Use the line graph to answer these questions.

Money Spent by Anna Richman on Movies, Records, and Entertainment



1. During which month was her entertainment cost the highest?

2. During which month did she spend the least money?

3. How much did she spend on entertainment in July?

4. What was the average amount she spent on entertainment during the months of June, July and August?

5. What was her total entertainment cost for the year?

6. During which month was her entertainment cost the lowest?

80

P.O. 6.14.03.04

NAME: ______________________ CLASS: ________ DATE: _______

Directions: Use the chart on this page to complete the line graph on the next page (8d).

Mr. and Mrs. S. Keemo love vanilla fudge ice cream. During one year they charted the amount of money spent on ice cream.

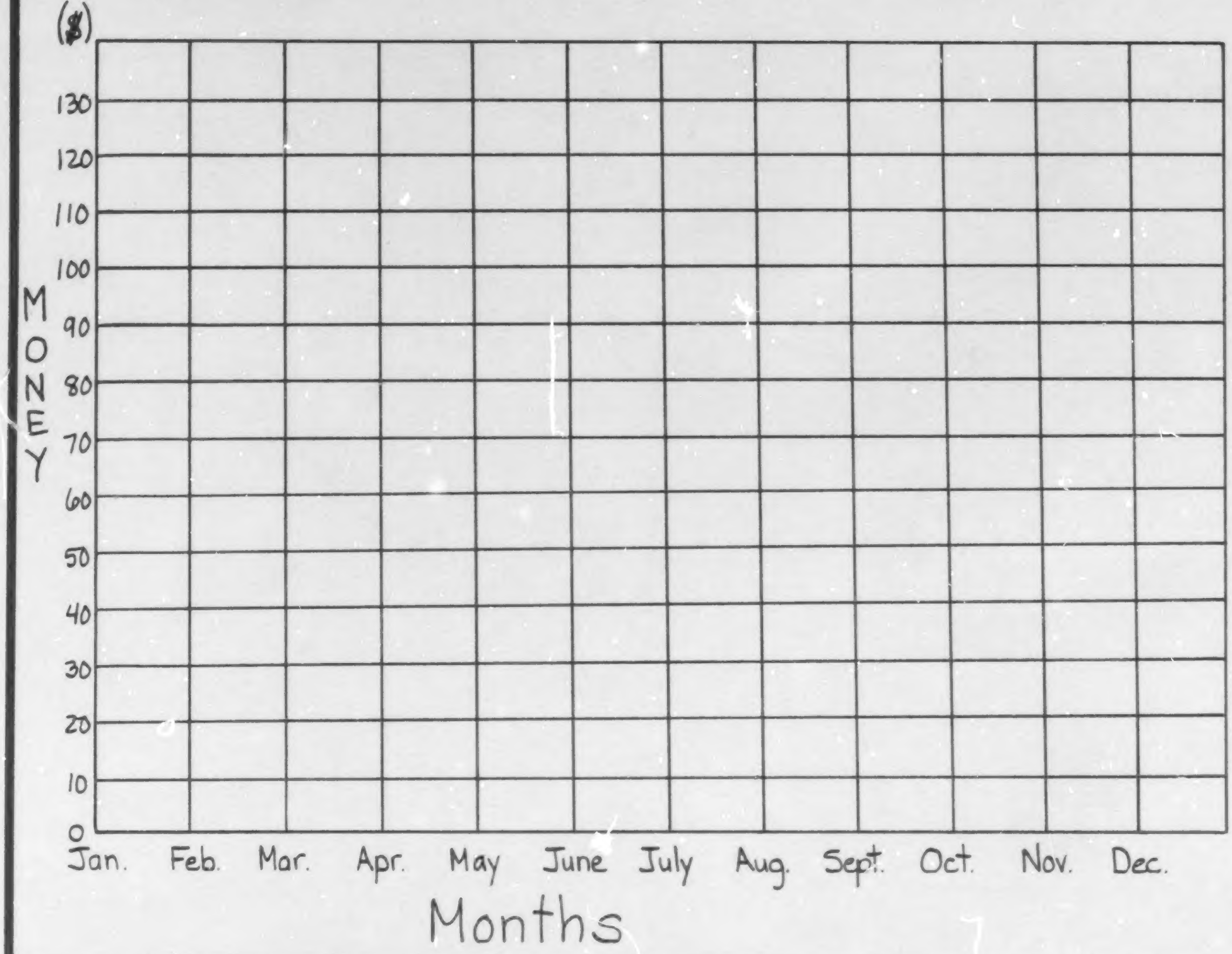
Money Spent on Ice Cream

Month	Amount
January	$20
February	$15
March	$30
April	$40
May	$55
June	$75
July	$120
August	$125
September	$70
October	$60
November	$40
December	$25

P.O. 6.14.03.04

NAME: ____________________ CLASS: ________ DATE: ________

Directions: Use the chart below to draw a line graph.



6.14.04 ADD 5-DIGIT NUMBERS

(ongoing)

PERFORMANCE OBJECTIVES

The student will be able to...

6.14.04.01 add a pair of numbers having 5-digits with regrouping and check;

e.g., check

$$\begin{array}{rcr} 59,624 & \qquad & \underline{92,506} \\ \underline{+32,882} & & 59,624 \\ 92,506 & & +32,882 \end{array}$$

6.14.04.02 add three or more numbers having through 5-digits with regrouping and check;

e.g., check

$$\begin{array}{rcrcr} 32,406 & \qquad & \$1,256.41 & \qquad & \underline{100,181} \\ 43,462 & & 371.09 & & 32,406 \\ \underline{+24,313} & & \underline{4,063.14} & & 43,462 \\ 100,181 & & \$5,690.64 & & +\ 24,313 \end{array}$$

6.14.04.03 solve word problems related to skills learned in this module.

e.g., Our school had three separate deliveries of paper during the last school year.

26,271 pieces of paper were delivered in September, 39,642 in January, and 21,792 in April. How much paper was delivered?

$$\begin{array}{r} 26,271 \\ 39,642 \\ \underline{+21,792} \\ 87,705 \end{array}$$

A total of 87,705 pieces of paper were delivered during the school year.

6.14.04

VOCABULARY

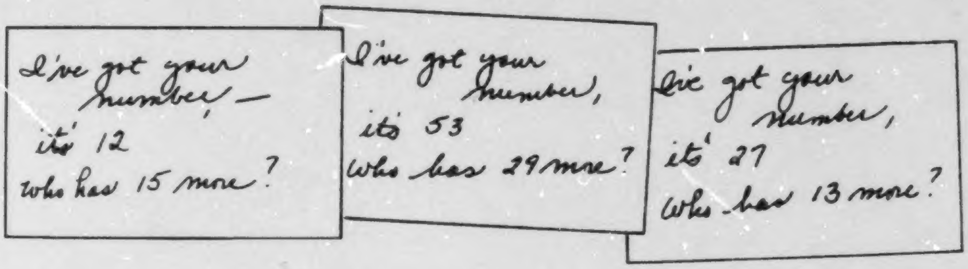
TERMS

exchange
thousands
ten thousands
sum
total

GETTING STARTED

Prepare enough cards, using only whole numbers, for each student to receive three cards.

Play the game called "I've Got Your Number" which reviews simple addition computation. To "design" the cards, begin by selecting a low number. (1) On a blank card, write, "I've got your number, it's 1. Who has 3 more?" This is the starting card of the game. Continue to make the cards shown in the sample. Adding 2-digit numbers to a 2-digit number is optional.
e.g.,



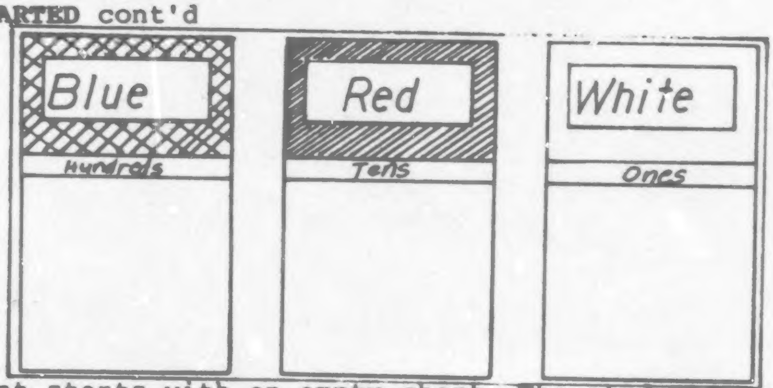
I've got your number, — it's 12 Who has 15 more?

I've got your number, it's 53 Who has 29 more?

I've got your number, it's 27 Who has 13 more?

Play "Chip Trading" to review addition with exchange. Prepare and distribute a chart and colored chips. (Paper clips can be used or squared materials representing ones, tens and hundreds can be distributed to each student. The game requires that each student have his/her own number cube (0 through 5) or his/her own numeral cards (1 through 9).

GETTING STARTED cont'd



Each student starts with an empty chart. The students may play in pairs or in groups of no more than four players. The students decide who will begin the game by rolling the number cube for the highest number.

The first player rolls a 4 and places four chips in the ones column. Remember to designate which chip and column represents ones, which chip and column represents tens, and which chip and column represents hundreds. The second player then rolls a 5 and places five chips in the ones column. No player can exchange one chip for another unless they get ten chips of the same color.

The first player rolls a 5 on the second roll. When the student places five more chips in the ones column, he/she will have nine chips all together. The student cannot exchange the ones for tens until they get ten or more chips. The game is played until one player obtains the first "one hundred" chip.

6.14.04

6.14.04.01 **add a pair of numbers having 5-digits with regrouping and check**

STRATEGY 1: Write these examples below on the chalkboard:

(1)	(2)	(3)	(4)	(5)
53	69	224	762	4,629
+32	+33	+152	+165	+3,798
85	102	376	927	8,427

Ask the students which examples do not require any exchanges." (Examples 1 and 3.) Ask, "Which examples require exchanging only from the ones column to the tens column?" (Example 2.) Ask, "Which example requires exchanging in the ones, tens and hundreds columns?" (Example 5.)

Say, "Complete all five examples and add each one twice (from top to bottom, and then from bottom to top) to check your computations."

Review the procedure for finding the sum of these five examples. Be sure that all the students have mastered finding the sum of at least 4-digit numbers.

Write the examples below on the chalkboard.
e.g.,

(1)	(2)	(3)
28,453	47,463	46,894
+31,241	+42,154	+21,583
59,694	89,617	68,477

Say, "Look at the three examples on the chalkboard. Determine which example, if any, requires no exchanges in any place value column." (Example #1.)

6.14.04

STRATEGY 1: cont'd

Ask, "Do any of the problems require at least one exchange?" (Examples 2 and 3.)

Direct the students to complete the three examples and to check their work by subtracting one of the addends from the sum. If the difference between the two numbers is exactly the same as the other addend, then the sum is correct.

e.g.,

	check
28,453	59,694
+31,241	-31,241
59,694	28,453

Prepare and distribute a set of 1-inch square numeral cards, containing the numerals 1 through 9 to each student. Prepare an activity sheet similar to this one below. Ask the students to discover what number tiles should be placed in the squares to make the examples correct.

e.g.,

68,□62	46,83□
+13,56□	+17,635
82,029	64,465
34,623	18,6□5
+14,□2□	+40,987
49,15□	59,622
□4,854	84,400
+89,773	+56,49□
154,627	140,8□2

6.14.04

STRATEGY 2: Write the following examples on the chalkboard.
e.g.,

(1)	(2)	(3)
467	6,489	1,358
+325	+6,502	+6,147
792	$\boxed{12{,}971}$	$\boxed{7{,}405}$
	12,991	7,505

(4)	(5)	(6)
748	4,632	6,148
+599	+7,690	+9,146
1,347	$\boxed{12{,}320}$	$\boxed{15{,}194}$
	12,322	15,294

Ask the students to find the errors in these examples, if any do exist, and compute the correct sums. Note: Actual answers do appear underneath incorrect answers.

6.14.04.02 **add three or more numbers having 5-digits with regrouping and check**

STRATEGY 1: Write the following example on the chalkboard:
e.g.,

68 + 43 + 99

Ask the students to find the sum (210) without using a pencil and paper.

Next write the same numbers vertically and instruct the students to find the sum without using a pencil and paper.

6.14.04

STRATEGY 1: cont'd

e.g.,

$$\begin{array}{r} 68 \\ 43 \\ \underline{+99} \end{array}$$

Ask, "Which method, the vertical or the horizontal, did you find the easiest to use to compute the sum?"

Remind the students that when changing the form of an example from the horizontal to the vertical, they should make sure that the numbers are placed in the correct columns.

Write the following examples on the chalkboard. Ask each student to rewrite them vertically, find the sum and check.
e.g.,

(1)
46,482 + 91,640 + 87,440 = 225,562

(2)
10,124 + 23,812 + 56,439 = 90,375

(3)
53,448 + 29,462 + 34,816 = 117,726

(4)
17,873 + 22,999 + 87,493 = 128,365

Discuss that adding three addends is similar to adding two addends.

Direct the students to find the sums of following examples written on the chalkboard.

6.14.04

STRATEGY 1: e.g.,
cont'd

(1)	(2)	(3)
25,863	17,213	45,238
82,416	87,419	74,671
+ 10,811	+ 29,008	+ 22,115
119,090	133,640	142,024

(4)	(5)	(6)
89,442	19,427	49,148
15,154	47,129	82,567
+ 18,180	+ 83,974	+ 24,095
122,776	150,530	155,810

6.14.04.03 **solve word problems related to skills learned in this module**

STRATEGY 1: Say, "During the 1983 soccer season, 78,316 Americans attended soccer games and 83,645 Canadians attended soccer games.

What was the combined attendance for both countries?"

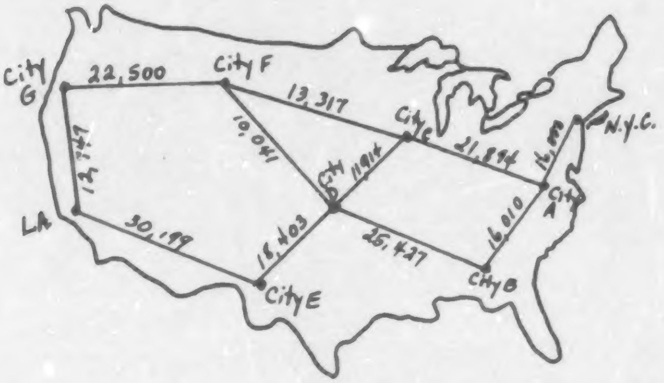
Ask, "What is being asked for?" (The total attendance for both countries.) "What information is given?" (The attendance at the American soccer games and the attendance at the Canadian soccer games.) "What mathematical operation must we use to solve the problem." (Addition.)

Ask, "What is our estimated sum?" (79,000 + 84,000 = 163,000) "What is the actual sum?" (78,316 + 83,645 = 161,961) "Is the exact sum reasonable as compared to our estimated sum?"

STRATEGY 1: cont'd

(Yes.) "How can we check our sum?" (By reversing the order of our addends and then adding.) Repeat this procedure, using other examples.

This map shows driving distances in meters.
e.g.,


City G
22,500
City F
13,317
City C
21,894
N.Y.C.
10,041
City D
11914
12,747
LA
30,199
15,403
25,427
16,010
City A
City B
City E

Mr. Jones decided to drive from New York City to Los Angeles to visit friends. Mr. Jones drove a total of 98,410 meters. Find the route that Mr. Jones had taken. List his starting point, all the cities and his ending point.

STRATEGY 2: Prepare the chart below and distribute a copy to each student.

The chart shows the attendance at the Mets baseball games by month and year.

Mets Attendance Record

Months	June	July	August
1980	12,344	31,272	24,568
1981	25,229	10,683	36,433
1982	41,374	12,532	21,945

78

6.14.04

STRATEGY 2: cont'd

Ask the students to answer the following questions by reading the chart.

(1) What was the attendance at Shea Stadium in July, 1980? (31,272)

(2) What was the attendance at Shea Stadium during July and August in 1980? (55,840)

(3) What was the attendance at Shea Stadium in June and July of 1982? (53,906)

(4) What was the attendance at Shea Stadium in June, July and August of 1981? (72,345)

(5) What was the total attendance at Shea Stadium in July for 1980, 1981 and 1982? (54,487)

(6) In what month, for all these years, was the total attendance at Shea Stadium, 82,946? (August)

P.O. 6.14.04. 01

NAME:____CLASS:_________DATE:_______

The word level when spelled left to right and right to left spells the same word.

A number that can be read left to right and right to left is called a Palindrome.

These are Palindromes: 747, 121, and 7667.

These are not Palindromes but are reversals:
75, 57, 123 and 321.

Finding a Palindrome.

1960	Write a number.
+0691	Reverse the numbers in the first number and add.
2651	Is this number a palindrome?
+1562	Reverse this number and add.
4213	Is this number a palindrome?
+3124	Reverse the numbers and add.
7337	Is this number a palindrome?

Reverse these numbers and add until they become palindromes.

4561	5224	1569	5813
6927	3258	2345	7285

P.O. 6.14.04. 02

NAME:______________________________ CLASS:__________ DATE:________

Directions: Use the chart to complete the questions below.

43,408	12,318	53,246
17,775	50,396	30,581
49,426	79,051	21,449

(1) What 3 numbers when added equal 51,542?

__________ + __________ + __________

(2) What 3 numbers when added equal 149,926?

__________ + __________ + __________

(3) What 3 numbers when added equal 96,145?

__________ + __________ + __________

(4) What 2 numbers when added equal 73,989?

__________ + __________

(5) What 2 numbers when added equal 129,447?

__________ + __________

P.O. 6.14.04.03

NAME:______________________________ CLASS:__________ DATE:__________

Directions: Work the problem. Put the letter over the line that has the answer to the problem.

My butcher is six feet tall.
What does he weigh?

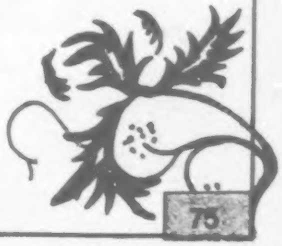
______	______	______	______
39,453	232,100	184,041	63,319

1) The attendance at Shea Stadium last week was 36,487. This week the attendance was 26,832. What was the total attendance for the two weeks? ___(T)___

2) The record holder for collecting bottle caps was 96,732. The runner up had collected 87,309 bottle caps. How many bottle caps were collected in all? ___(A)___

3) The local post office sold 37,835 regular stamps. They sold 1,276 air mail stamps and 342 special delivery stamps. How many stamps did they sell? ___M___

4) United Airlines had 88,432 passengers leaving from Kennedy Airport. Delta Airlines had 79,362 and Eastern Airlines had 64,306 passengers leaving. What was the total amount of passengers leaving Kennedy Airport? ___(E)___



6.14.05 SUBTRACT 3- THROUGH 5-DIGIT NUMBERS

(ongoing)

PERFORMANCE OBJECTIVES

The student will be able to...

6.14.05.01 estimate differences by rounding minuends and subtrahends (less than 100,000) to the nearest 10,000;

e.g., To the nearest ten thousand:

$$\begin{array}{rcr} 58{,}243 & \text{rounds to} & 60{,}000 \\ \underline{-12{,}690} & \text{rounds to} & -\underline{10{,}000} \\ 45{,}553 & & 50{,}000 \end{array}$$

6.14.05.02 subtract 3- through 5-digit numbers with regrouping and check;

e.g.,

$$\begin{array}{rcr} & & \underline{\text{check}} \\ 32{,}462 & & 13{,}531 \\ \underline{-13{,}531} & & \underline{+18{,}931} \\ 18{,}931 & & 32{,}462 \end{array}$$

$$\begin{array}{rcr} & & \underline{\text{check}} \\ \$961.92 & & \$\ 74.86 \\ \underline{-\ 74.86} & & \underline{+887.06} \\ \$887.06 & & \$961.92 \end{array}$$

6.14.05.03 solve word problems related to skills learned in this module.

e.g.,

On Monday, the Courier sold 17,538 newspapers. On that same day the City Reporter sold 23,987 newspapers.

Which newspaper sold more copies on Monday? (The City Reporter sold more copies on Monday.)

To the nearest ten thousand, how many more newspapers did the City Reporter sell than the Courier?

$$\begin{array}{rcr} 23{,}987 & \text{rounds to} & 24{,}000 \\ \underline{-17{,}538} & \text{rounds to} & \underline{-18{,}000} \\ & & 6{,}000 \end{array}$$

Approximately 6,000 more newspapers were sold by the City Reporter.

How many more newspapers were sold by the City Reporter than the Courier?

$$\begin{array}{rcr} & & \underline{\text{check}} \\ 23{,}987 & & 17{,}538 \\ \underline{-17{,}538} & & \underline{+6{,}449} \\ 6{,}449 & & 23{,}987 \end{array}$$

Actually, 6,449 more newspapers were sold by the City Reporter.

6.14.05

VOCABULARY

TERMS

subtract
difference
minuend
subtrahend
rounding off
inverse

GETTING STARTED

Write the numeral 78,346 on the chalkboard. Ask, "If we round this numeral to the nearest 10,000, how many zeros must it have?" (4) "What digit is in the ten thousands place?" (7) "What digit is to the immediate right of the ten thousands place? (8) "Is eight more or less than five?" (More than five.) "Does the seven in the ten thousands place remain seven or do we round off to eight?" (We round off to eight.) "What is 78,346 rounded to the nearest ten thousand?" (80,000)

Write 641,899 on the chalkboard. Ask, "If we round this numeral to the nearest 100,000, how many zeros must it have?" (5) "What digit is in the hundred thousands place?" (6) "What digit is to the immediate right of the hundred thousands place?" (4) "Is four more or less than five?" (Less than five.) "Does the six remain at six or do we round off to seven?" (It stays at six.) "What is 641,899 rounded to the nearest hundred thousand?" (600,000)

Place enough 3- through 5-digit numeral cards in a box so that you have at least one card per student. Ask each student to choose a card. Say, "Do not show your card to anyone. Write this numeral in your notebook. Round your numbers to the nearest hundred, thousand and/or ten thousand. Exchange the number card with your neighbor. Round this numeral to the nearest hundred, thousand and/or ten thousand. When you are finished, compare your answers."

Prepare oaktag cards with a subtraction fact on one side and related addition facts on the other side.

GETTING STARTED cont'd

e.g.,	8 - 5 = 3	3 + 5 = 8 5 + 3 = 8
	FRONT	BACK

Display the first card to the students. Ask, "What addition facts are related to this subtraction fact?" (3 + 5 = 8 or 5 + 3 = 8) Turn the card over. "What kind of mathematical operations are subtraction and addition?" (Inverse operations.) Ask, "What is the definition of inverse operations?" (Inverse operations are opposite mathematical operations.) Display other cards and ask for the inverse or the related addition fact for each.

e.g.	31 - 7 = 24 31 - 24 = 7	24 + 7 = 31 7 + 24 = 31
	FRONT	BACK

Ask students to form a circle to play "Name Three." A student is selected to be "It." "It" makes up a subtraction example with no more than three digits in any of the numbers, and then writes the example on the chalkboard.

e.g., 141 - 78 = ☐

"It" selects a student to "Name Three" related facts. This student may compute the example at the chalkboard. He/She then gives three related facts.

e.g., 141 - 78 = 63

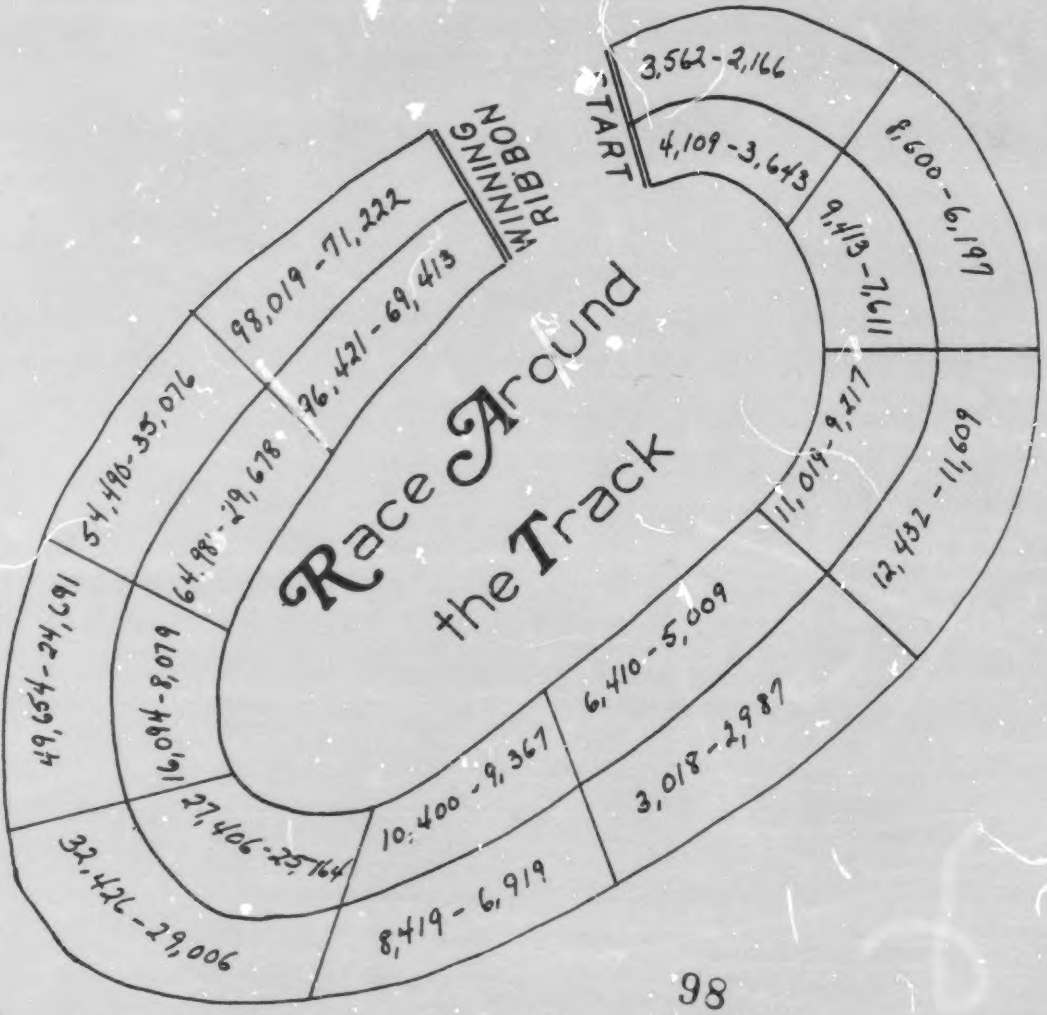
Related Facts
141 - 63 = 78
78 + 63 = 141
63 + 78 = 141

6.14.05

6.14.05.01 estimate differences by rounding minuends and subtrahends (less than 100,000) to the nearest 10,000

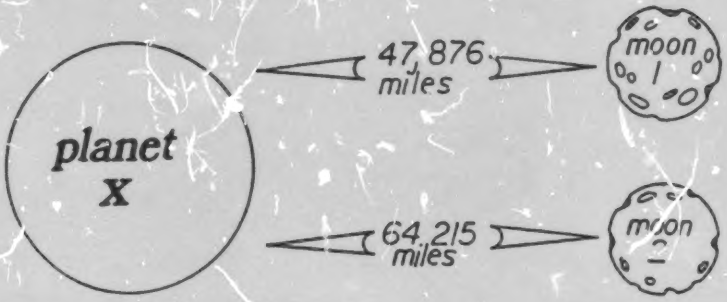
STRATEGY 1: Divide the class into two teams. Display the gameboard on large oaktag or on an overhead projector. One team will race around the inside track and the other team will race around the outside track. Decide which team goes first. The player must correctly estimate the answers until an answer is wrong. Then the next team proceeds. The first team to reach the winning ribbon wins.

e.g.,


START
3,562-2,166
4,109-3,643
8,600-6,197
9,413-7,611
11,019-9,217
12,432-11,609
6,410-5,009
3,018-2,987
10,400-9,367
8,419-6,919
27,406-25,764
32,426-29,006
16,094-8,079
49,654-24,691
64,981-29,678
54,490-35,076
96,421-69,413
98,019-71,222
WINNING RIBBON
Race Around the Track

STRATEGY 2: Display this diagram to the students:

e.g.,



Ask, "Moon two is approximately how much farther away from Planet X than Moon one?" Ask, "What does approximately mean?" (Approximately means that we do not need an exact answer.)

"How can we obtain an approximate answer?" (We obtain an approximate answer by rounding the respective distances from Planet X to Moon 1 and Moon 2 to the nearest hundred thousand or to the nearest ten thousand and then by subtracting.)

Ask, "What is 64,215 rounded to the nearest ten thousand?" (60,000) "What is 47,876 rounded to the nearest ten thousand?" (50,000) "What is the difference between 60,000 and 50,000?" (10,000)

Ask, "What word could have been substituted for approximate in this example?" (Estimate.)

Repeat this procedure using other examples.

6.14.05.02 subtract 3- through 5-digit numbers with regrouping and check

STRATEGY 1: Write a subtraction example on the chalkboard

e.g.,

```
 8,342
-7,896
```

Ask, "How do we subtract if a digit in the minuend

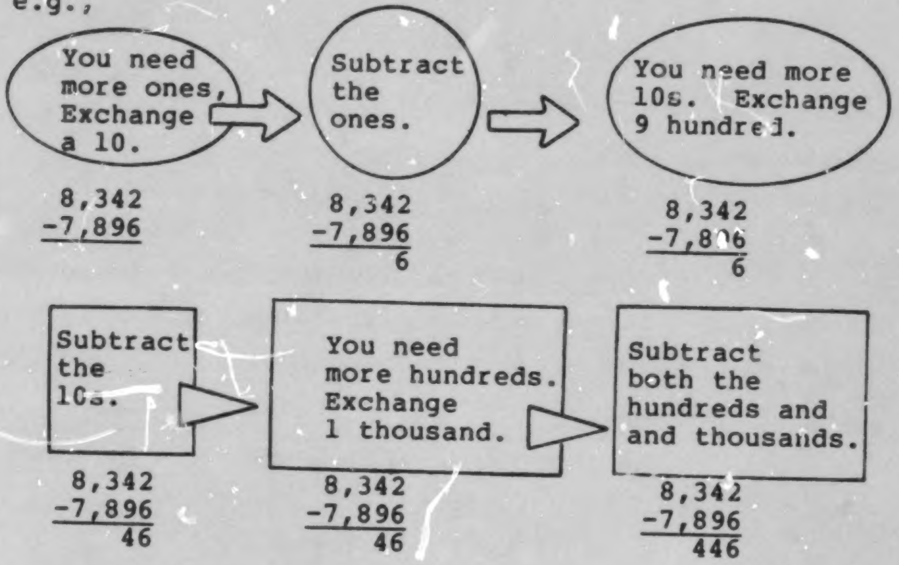
6.14.05

STRATEGY 1: cont'd

(top number) is smaller than the digit in the same place of the subtrahend (bottom number)? (We regroup or exchange.)

Construct a flow chart on the chalkboard.

e.g.,

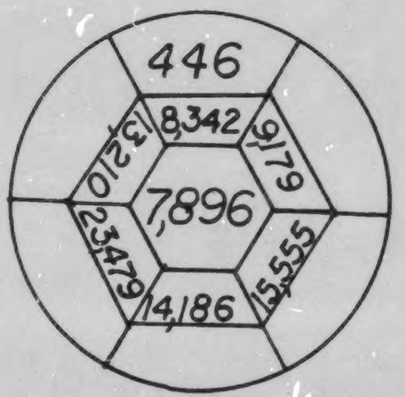

You need more ones, Exchange a 10.
8,342
-7,896
Subtract the ones.
8,342
-7,896
6
You need more 10s. Exchange 9 hundred.
8,342
-7,896
6
Subtract the 10s.
8,342
-7,896
46
You need more hundreds. Exchange 1 thousand.
8,342
-7,896
46
Subtract both the hundreds and and thousands.
8,342
-7,896
446

Ask, "HOw is the difference checked?" (Since addition is the inverse of subtraction, we can use addition to check subtraction.)

e.g.,

subtract	check
8,342 -7,896 446	7,896 + 446 8,392

STRATEGY 2: Display a chart to the students.


446
8,342
9,179
15,555
14,186
23,479
13,210
7,896

STRATEGY 2: cont'd

Say, "This chart is called a practagon because it gives practice in a particular skill. Subtraction examples are to be performed by beginning with 7,896 and subtracting each of the numbers around its circumference.

e.g.,

$$\begin{array}{r} 8,342 \\ -7,896 \\ \hline 446 \end{array}$$

The difference for each example is to be placed in the adjoining space.

e.g.,

"The difference for 8,342 and 7,896 would go in the 12 o'clock position." (446) Ask the students to complete the examples one step at a time. Write a flowchart on the chalkboard to keep track of the steps.

Ask the students to complete the practagon in their notebooks.

6.14.05.03 **solve word problems related to skills learned in this module**

STRATEGY 1: Write the following number problem on the chalkboard.

e.g.,

On Saturday, attendance at an
amusement park was 24,317. On
Sunday, the attendance was 32,249.
How many more people were at the
amusement park on Sunday than on
Saturday?

Ask, "What is the first step in solving this problem?" (Read the problem.) "What mathematical operation should be used?" (Subtraction.) "What is

STRATEGY 1 cont'd

the minuend?" (32,249.) "What is the subtrahend?" (28,317.) "What are we trying to find?" (The difference.)

What should be done before the actual subtraction?" (Estimate or approximate the difference by rounding the minuend and the subtrahend to the nearest ten thousand and then by subtracting.)

e.g.,

```
 32,239  rounds to  30,000
-24,317  rounds to -20,000
  7,932             10,000
```

Ask, "What should be done next? (The actual subtraction.) "What should be done after the actual subtraction?" (The actual difference 7,932 should be checked with respect to its reasonableness to the estimated difference 10,000.

Ask the students to solve a variety of problems, using this estimation technique.

STRATEGY 2:

Write the following problem on the chalkboard, and then ask one of the students to read it aloud.

> The George Washington Bridge can hold a maximum load of_______ pounds. The Brooklyn Bridge can hold a load of _______ pounds. Which bridge can hold the greatest maximum load?

Say, "Who can place a large number having 3- through 5-digits in the first blank? Who can place a large number in the second blank? What is the first step in solving this problem?" (Read the problem to determine what is asked for and what information is given.) "For this problem, we are asked to find the bridge that holds the greatest maximum load. We are given the load for each bridge. What do we do as our second step?" (Determine what operation to use.) In order

STRATEGY 2: cont'd

to find the greatest maximum load, we must subtract. Ask, "What is the third step in solving this problem?" (Estimate the answer by rounding the numbers to the largest possible place.) Round the numbers in this problem. Ask, "What is the fourth step?" (Do the computation.) Add the numbers in the problem. Ask, "What is the last step in problem solving?" (Check the answer against the estimate and determine its reasonableness.)

Complete by checking the problem on the chalkboard.

(2) The local newspaper sells _______ papers on Thursday. How many more papers does the newspaper need to sell to reach _______?

Ask the students to solve the problem after asking two of them to substitute 3-, 4-, or 5- digit numbers in the blanks. (The second number must be more than the first.) Ask, "What are the steps in solving a number problem? (Read the problem. Determine the mathematical operation to be used. Estimate the answer by rounding each number in the problem to the highest possible place and then performing the necessary operation(s). Do the actual computations. Check the reasonableness of the actual answer to the estimated answer.)

Ask the students to solve a variety of subtraction problems using this estimation technique. In each instance, allow the students to select their own 3-, 4-, or 5-digit numbers.

STRATEGY 2: Write this problem on the chalkboard, and then ask one of the students to read it aloud:

(1) The George Washington Bridge can hold a maximum load of_______ pounds. The Brooklyn Bridge can hold a load of _______ pounds. Which bridge can hold the greatest maximum load?

Say, "Who can place a large number having 3-through 5-digits in the first blank?..Bill? Who can place a large number in the second blank?...Joan?"
Ask, "What is the first step in solving this problem?" (Read the problem to determine what is asked for and what information is given.) For this problem, we are asked to find the bridge that holds the greatest maximum load. We are given the load for each bridge.

Ask, "What do we do as our second step?" (Determine what operation to use.) In order to find the greatest maximum load, we must subtract.

Ask, "What is the third step in solving this problem?" (Estimate the answer by rounding the numbers to the largest possible place.) Round the numbers in this problem. Ask, "What is the fourth step?" (Do the computation.) Add the numbers in the problem. Ask, "What is the last step in problem solving?" (Check the answer against the estimate and determine its reasonableness.)

Complete by checking the problem on the chalkboard.

(2) The local newspaper sells _______ papers on Thursday. How many more papers does the newspaper need to sell to reach _______?

Ask the students to solve the problem after asking two of them to substitute 3-, 4-, or 5- digit numbers in the blanks. (The second number must be more than the first.) Ask, "What are the steps in solving a

STRATEGY 2: cont'd

number problem? (Read the problem. Determine the mathematical operation to be used. Estimate the answer by rounding each number in the problem to the highest possible place and then performing the necessary operation(s). Do the actual computations. Check the reasonableness of the actual answer to the estimated answer.)

Ask the students to solve a variety of subtraction problems using this estimation technique. In each instance, allow the students to select their own 3-, 4-, or 5-digit numbers.

P.C. 6.14.05.01

NAME:____CLASS:__________DATE:________

I.

Estimate the difference. First round each number to the nearest ten thousand.

(1) 67,214 - 21,379 = 70,000 - 20,000 = 50,000

(2) 36,178 - 28,333 = ________________

(3) 65,324 - 66,666 = ________________

(4) 43,165 - 28,888 = ________________

(5) 58,314 - 42,178 = ________________

(6) 55,555 - 23,465 = ________________

(7) 14,796 - 9,999 = ________________

II.

Estimate the difference. First round each number to the nearest thousand.

(8) 74,876 - 28,643 = 75,000 - 29,000 = 46,000

(9) 55,555 - 44,444 = ________________

(10) 37,215 - 16,248 = ________________

(11) 58,324 - 32,173 = ________________

(12) 89,214 - 36,782 = ________________

(13) 42,169 - 22,888 = ________________

(14) 68,123 - 45,678 = ________________

(15) 82,175 - 21,269 = ________________

P.O. 6.14.05.02

NAME: ______________________________ CLASS: __________ DATE: ________

Directions: I. Subtract and check.
II. Read each example and compute.

I.

1) 2,359 - 1,690= ______________________________

2) 7,262 - 3,573= ______________________________

3) 432 - 278= ______________________________

4) 681 - 291= ______________________________

5) 35,472 - 6,371= ______________________________

6) 54,271 - 53,210= ______________________________

7) 77,943 - 69,212= ______________________________

II.

8) Subtract 867 from 924.

9) From 3,732 take 1,850.

10) Find the difference between 18,254 and 21,921.

11) The minuend is 86,349, the subtrahend is 19,999. Find the difference.

12) Take 9,316 from 10,069.

P.O. 6.14.05.03

NAME:______________________________CLASS:________DATE:________

Directions: Solve each number problem.

1) There are 2,389 pupils in Smith Junior High School. If 678 graduate in June how many pupils will still be left?

2) A baseball team played 162 games. They won 105 games. How many games did they lose?

3) A theater can hold 4,378 people. There are 3,198 people already seated. How many more people can be seated in the theater?

4) A man weighed 369 pounds before a diet and 278 pounds after the diet. How much weight did the man lose?

P.O. 6.14.05.03

NAME:____CLASS:__________DATE:_______

Directions: Solve each number problem.

5) 23,789 people are attending an outdoor concert. It begins to rain and 5,086 people leave the concert. How many people are left?

6) A warehouse contains 5,032 cases of Brand X beer and 5,023 cases of Brand Y Beer. How many more cases of Brand X beer does the warehouse have than Brand Y beer?

7) 895 people were jogging in a park on Monday morning. How many more joggers are needed to make 1000?

8) A car dealer begins the year with 923 cars. The dealer sells 845 cars during the year. How many cars are left?

9) A salesman earns $8,765 in December and $4,999 in February. How much less money did the salesman make in February than in December?

10) James has $845 in the bank. How much more does he need to save in order to buy a $1,100 stereo system?

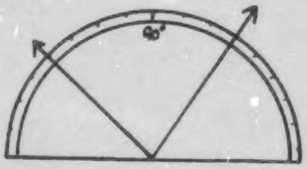
6.14.06 ANGLES

(ongoing)

PERFORMANCE OBJECTIVES

The student will be able to...

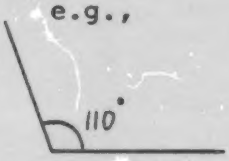
6.14.06.01 measure angles by using a protractor;
e.g.,



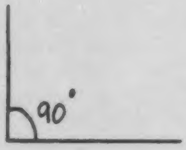
6.14.06.02 recognize acute, obtuse, right, and straight angles by the number of degrees;
e.g.,

45° is an ACUTE ANGLE
90° is a RIGHT ANGLE
180° is a STRAIGHT ANGLE
130° is an OBTUSE ANGLE

6.14.06.03 identify acute, obtuse and straight angles in relation to right angles;
e.g.,



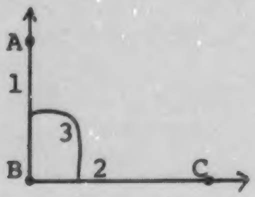
GREATER THAN



OBTUSE RIGHT

6.14.06.04 name angles using letter and symbol notation.

e.g.,



side 1 = AB
side 2 = BC
B = vertex

angle 3 ——> ∡ ABC

6.14.06

VOCABULARY

TERMS

- protractor
- acute angle
- right angle
- obtuse angle
- straight angle

TERMS

- vertex
- point
- ray
- line segment
- line

GETTING STARTED

Draw a dot on the chalkboard and ask, "Do you know another name for this dot?" (Point.) Say, "Points are locations in space and the dot is a symbol for a point. We use capital letters to name points."

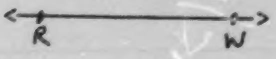
e.g., A · point A F · point F

Draw a straight line on the chalkboard.

e.g., <————————————>

Ask, "What is this called?" (A straight line.)
Ask, "What do the arrow tips indicate?" (The line goes on forever in two directions.) Say, "We name a straight line by selecting two points on the line and naming them with capital letters."

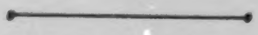
e.g.,



line RW or line WR $\overleftrightarrow{WR}$

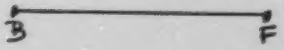
Draw a line segment on the chalkboard.

e.g.,



Ask, "Why isn't this a straight line? (A line segment stops in two places called endpoints. A straight line has no endpoints.) Ask, "How do we name a line segment?" Say, "A line segment derives its name from the two endpoints."

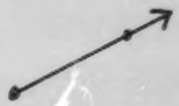
e.g.



line segment BF or line segment FB $\overline{FB}$

Draw a ray on the chalkboard.

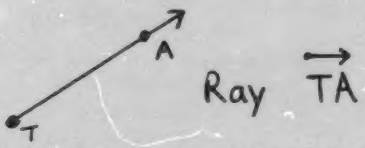
e.g.,



GETTING STARTED cont'd

Ask, "What does this look like?" (A combination of a line segment and a straight line.) Say, "A ray has one endpoint and goes on forever in one direction. We use two points to name a ray. The endpoint must be listed first."

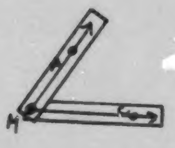
e.g.,



Ask the students to classify and name various points, lines, line segments and rays.

Display two rays on strips of oaktag tacked together at the endpoints.

e.g.,



Ask the students to name the rays. (Ray MA and Ray MC.) Ask, "What do these rays have in common?" (The endpoint M.) Say, "An angle is formed when two rays meet at the same endpoint. The common endpoint is called the vertex. Each ray is a side of the angle."

Repeat this procedure, using other strips of oaktag. Instruct students to name the vertex and sides of each angle.

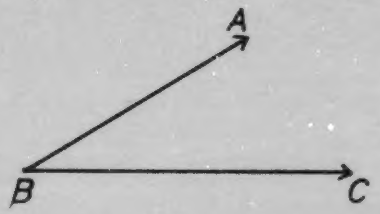
6.14.06

6.14.06.01 measure angles by using a protractor

STRATEGY 1: Distribute protractors to the students. Ask, "What do we call this instrument?" (A protractor.) "What does a protractor do?" (It measures angles.) "What do we mean by the measure of an angle?" (The measure of an angle is the amount of space inside the opening between the two sides.) Say, "The standard unit of angle measure is called a degree, which is written (°)."

Distribute rexographed sheets on which various size angles are drawn. Draw the first angle on the chalkboard.

e.g.,



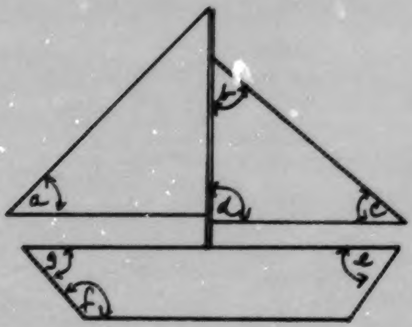
Demonstrate how to measure the angle using a large demonstration protractor. Say, "Place the protractor so that its center is on the vertex of the angle (B). Line up the straight part of the protractor exactly with the lower line of the angle (BC). BC should line up with the 0° mark of the protractor. See where the top line of the angle crosses the protractor. If the angle opens on the right, use the top scale. If the angle opens on the left, use the bottom scale along the top of the protractor. The number where the line crosses is the size of the angle in degrees."

Ask the students to measure angles in their workbooks.

STRATEGY 2: Distribute protractors to the students. Display a drawing of a sailboat and distribute a rexographed

STRATEGY 2: cont'd

copy of this drawing to the students.
e.g.,



Ask, "What do all the numbers represent?" (Angles.) Say, "We are going to use the protractor to measure each of these angles. The measure of an angle is the amount of space inside the opening between the two sides. The standard unit of angle measure is called a degree, which is written (°)."

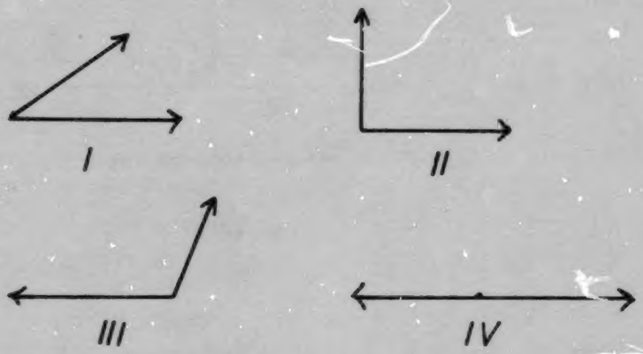
Demonstrate how to measure Angle I using a protractor. Say, "Place the protractor so that its center is on the vertex of the angle. Line up the straight part of the protractor exactly with the lower line of the angle. See where the top line of the angle crosses the protractor. If the angle opens on the right, use the top scale along the top of the protractor. If the angle opens on the left, use the bottom scale along the top of the protractor. The number where the top line of the angle crosses is the size of the angle in degrees."

Ask some students to measure angles a through g at the chalkboard while the other students measure the same size angles on their rexograph sheets.

6.14.06

6.14.06.02 **recognize acute, obtuse, right and straight angles by the number of degrees**

STRATEGY 1: Draw these four angles on the chalkboard.



Ask a student to measure angle I (45°). Ask, "What do we call an angle which measures 45°?" (An angle which measures more than 0° but less than 90° is called an acute angle.)

Ask a student to measure angle II (90°). Ask, "What is the name of an angle which measures 90°?" (An angle which measures exactly 90° is called a right angle.)

Ask a student to measure angle III (110°). Ask, "What is the name of an angle which measures 110°?" (An angle that measures more than 90° but less than 180° is called an obtuse angle.)

Ask a student to measure angle IV (180°). Ask, "What is the name of an angle which measures 180°?" (An angle which measures exactly 180° is called a straight angle.)

Repeat this procedure, using other examples.

STRATEGY 2: Display the following chart:

e.g.,

Classifying Angles

By The Number Of Degrees

Name of Angle	Number of Degrees
I	Greater than 0° but less than 90°
II	Equal to 90°
III	Greater than 90° but less than 180°
IV	Equal to 180°

Say, "We are going to complete this chart together." Ask, "What is the name of an angle greater than 0° but less than 90°?" (Acute Angle.) "What is the name of an angle equal to 90°?" (Right angle.) "What is the name of an angle greater than 90° but less than 180°?" (Obtuse angle.) "What is the name of an angle equal to 180°?" (Straight angle.)

Ask students to classify various angles by their number of degrees.

e.g.,

78°	(Acute angle)
146°	(Obtuse angle)
90°	(Right angle)
180°	(Straight angle)

6.14.06.03 **identify acute, obtuse and straight angles in relation to right angles**

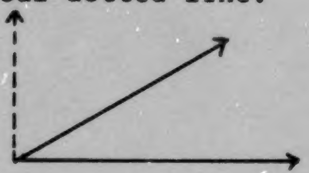
STRATEGY 1: Draw a right angle on the chalkboard.

e.g.,

STRATEGY 1: cont'd

Ask, "What is the name of this angle?" (Right Angle.) Draw an acute angle on the chalkboard along with a vertical dotted line.

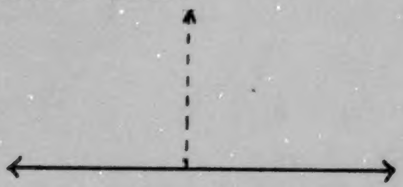
e.g.,



Ask, "If the vertical dotted line represents a side of a right angle formed with the horizontal solid line, is the angle formed by the two solid lines greater than the right angle or less than the right angle?" (Less than the right angle) "What are angles called which measure less than a right angle?" (Acute angles.)

Draw a straight angle on the chalkboard along with a vertical dotted line.

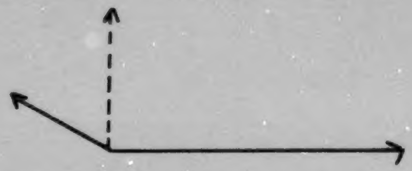
e.g.,



Say, "The vertical dotted line represents a side of a right angle formed with the solid horizontal line to the right. Is the angle formed by the two solid lines greater than the right angle or less than the right angle?" (Greater than the right angle.) "How many right angles do you see?" (Two.) "How many degrees is this angle?" (180°.) "What is the name of an angle equal to 180°?" (Straight angle.)

Draw an obtuse angle on the board along with a vertical dotted line and a horizontal dotted line.

e.g.,



118

STRATEGY 1: cont'd

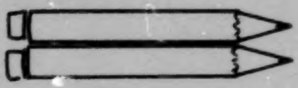
Ask, "If the vertical dotted line represents a side of a right angle formed with the solid horizontal line, is the angle formed by the two solid lines greater than a right angle or less than a right angle?" (Greater than a right angle.) "Is this same angle greater than or less than the straight angle formed by the horizontal dotted line and the horizontal solid line?" (Less than the straight angle) "What do we call an angle whose measure is greater than a right angle but less than a straight angle?" (An obtuse angle.)

Repeat this procedure, using different examples.

STRATEGY 2:

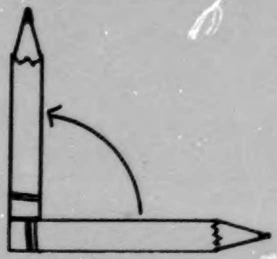
Hold two pencils horizontally (on top of each other) against the chalkboard.

e.g.,



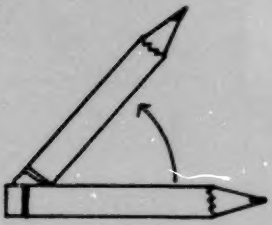
Rotate the top pencil counterclockwise to form a right angle.

e.g.,



Ask, "What is the name of this angle?" (A right angle.) Return the pencils back to their starting position (see above) and rotate the top pencil counterclockwise to form an acute angle.

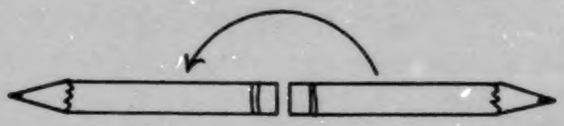
e.g.,



STRATEGY 2: cont'd

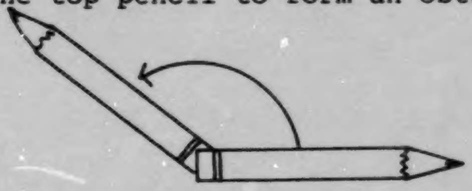
Ask, "Is this angle less than or greater than the right angle?" (Less than the right angle) Ask, "What do we call an angles whose measure is less than a right angle?" (An acute angles.)

Return the pencils back to the starting position and rotate the top pencil counterclockwise to form a straight angle.
e.g.,



Ask, "Is this angle less than or greater than a right angle?" (Greater than a right angle.) "What does this angle look like?" (A straight line.) "What is the name of this angle?" (A straight angle.)

Place the pencils back to the starting position and rotate the top pencil to form an obtuse angle.
e.g.,



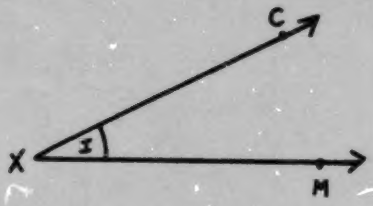
Ask, "Is this angle less than or greater than a right angle?" (Greater than a right angle.) "Is this angle less than or greater than a straight angle?" (Less than a straight angle.) "What do we call an angle whose measure is more than a right angle but less than a straight angle?" (An obtuse angle.)

Repeat this procedure by asking students to demonstrate angles using their pencils.

6.14.06

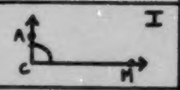
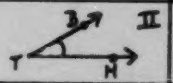
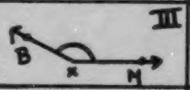
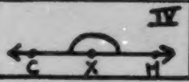
6.14.06.04 name angles using letter and symbol notation

STRATEGY 1: Draw this angle on the chalkboard.
e.g.,



Ask, "What are the names of the rays (sides) that formed this angle?" (Ray XC and Ray XM.) "What is the vertex of this angle?" (X.) "What is the mathematical notation for naming this angle?" (The symbol for angle is ∡ , and angles are always named with three capital letters. The middle letter must be the vertex. The name of this angle is
∡ CXM or ∡ MXC.) Ask, "Are there any other names for this angle?" (We may use the vertex to name an angle as well as any enclosed number. Two other names for this angle are ∡ I or ∡ X.)
Repeat this procedure, using other examples.

STRATEGY 2: Display the following chart:

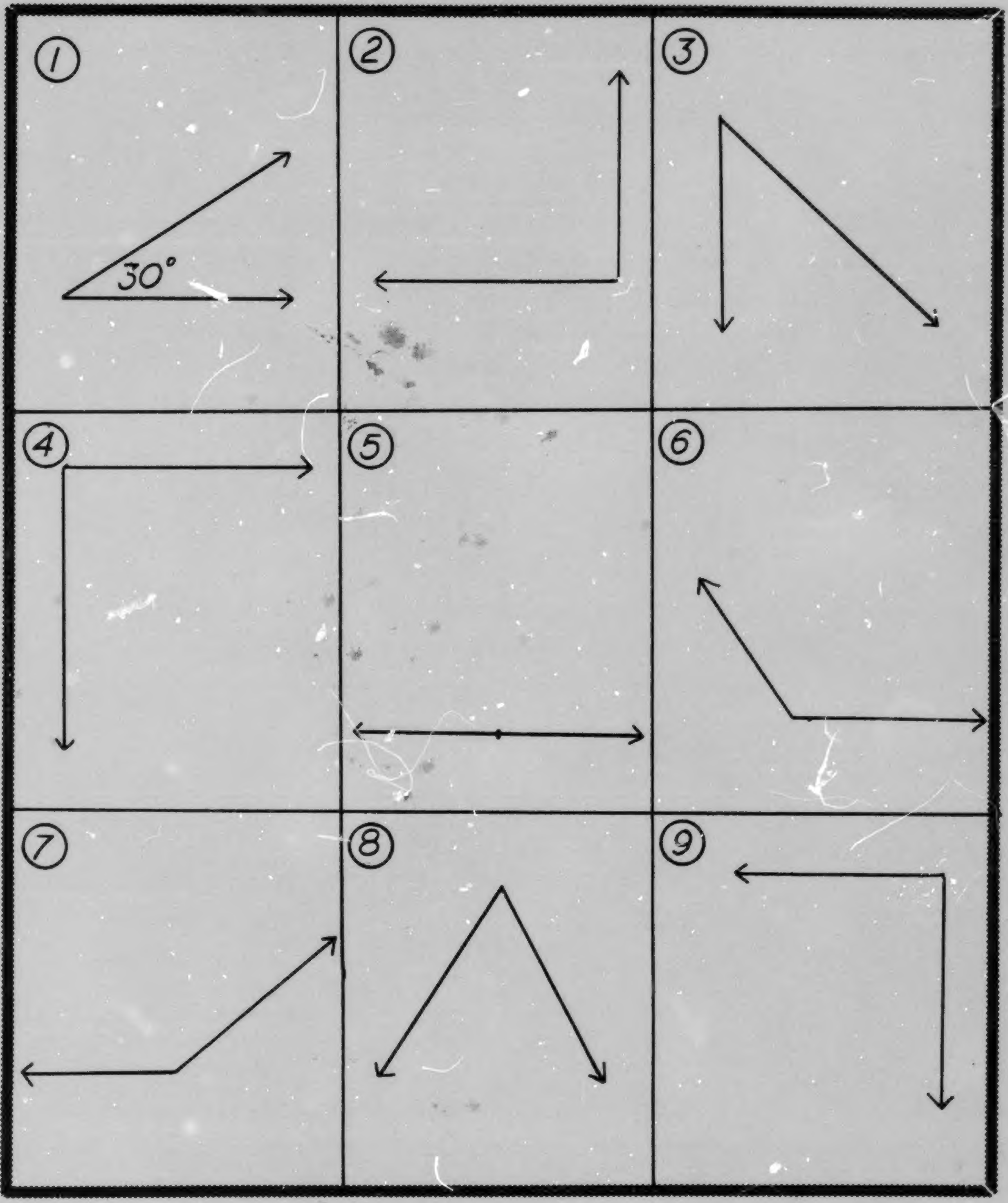
	Vertex	Sides	Kind of Angle
			
			
			
			

Measure the angles. Complete the chart.

P.O. 6.14.06.01

NAME:______________________________ CLASS:__________ DATE:________

Directions: Measure each angle with a protractor.


①
30°
②
③
④
⑤
⑥
⑦
⑧
⑨

P.O. 6.14.06.02

NAME: ________________________________ CLASS: ________ DATE: _______

Directions: Why did the pinch hitter want to bat underwater? For each angle below, circle the correct choice of acute, right, obtuse or straight. The letters of the correct answers spell out the answer.

1.	2°	T) acute	U) right	V) obtuse	W) straight
2.	99°	M) acute	N) right	O) obtuse	P) straight
3.	88°	B) acute	C) right	D) obtuse	E) straight
4.	91°	C) acute	D) right	E) obtuse	F) straight
5.	90°	O) acute	P) right	Q) obtuse	R) straight
6.	159°	S) acute	T) right	U) obtuse	V) straight
7.	42°	T) acute	U) right	V) obtuse	W) straight
8.	35°	I) acute	J) right	K) obtuse	L) straight
9.	180°	K) acute	L) right	M) obtuse	N) straight
10.	20°	A) acute	B) right	C) obtuse	D) straight
11.	120°	Q) acute	R) right	S) obtuse	T) straight
12.	50°	A) acute	B) right	C) obtuse	D) straight
13.	150°	Q) acute	R) right	S) obtuse	T) straight
14.	101°	S) acute	T) right	U) obtuse	V) straight
15.	68°	B) acute	C) right	O) obtuse	E) straight

He wanted ___ ___   ___ ___   ___ ___ ___
1 2 3 4 5 6 7

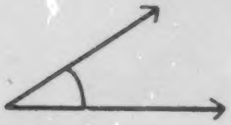
___ ___   ___ ___   ___   ___ ___ ___
8 9 10 11 12 13 14 15

P.O. 6.14.06.03

NAME: ______________________ CLASS: __________ DATE: ________

Directions: Write > (greater than) or < (less than) in the circle.
Identify each type of angle.

①



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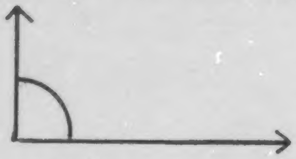
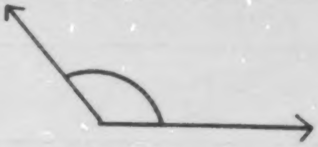


ACUTE ANGLE

RIGHT ANGLE

②



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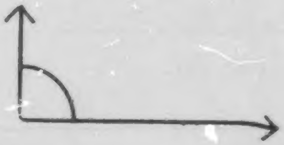
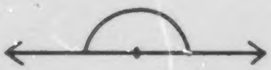


______________________ ______________________

③



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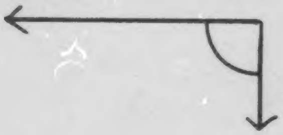

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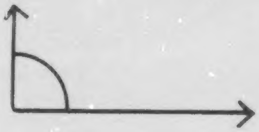
④



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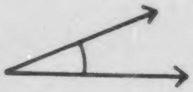

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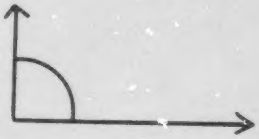

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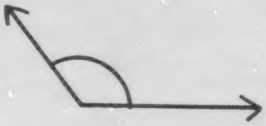

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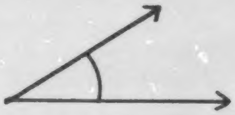

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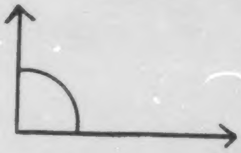

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P.O. 6.14.06.04

NAME: ______________________ CLASS: __________ DATE: ______

Directions: Name each angle three ways.

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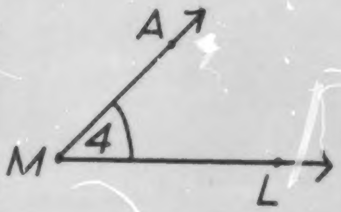

∢ AML
∢ M
∢ 4

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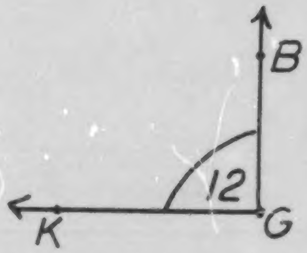

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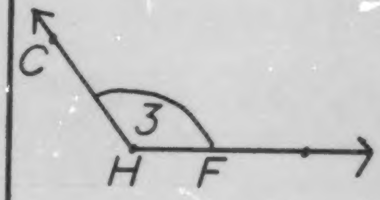

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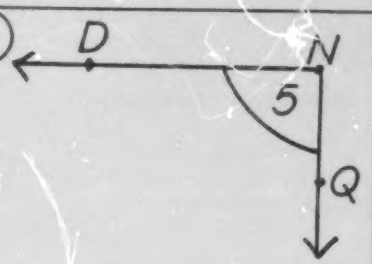

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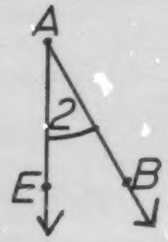

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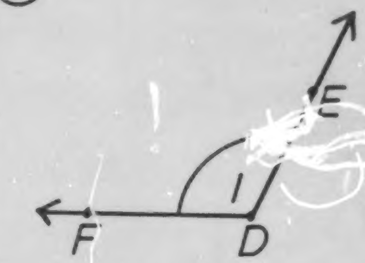

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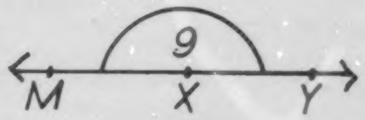

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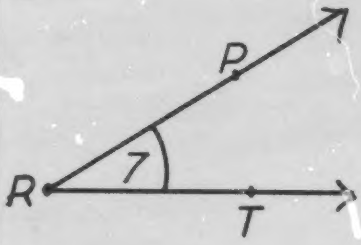

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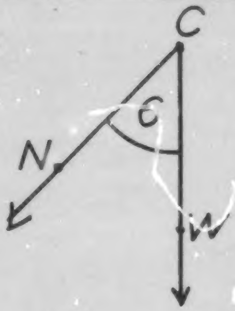

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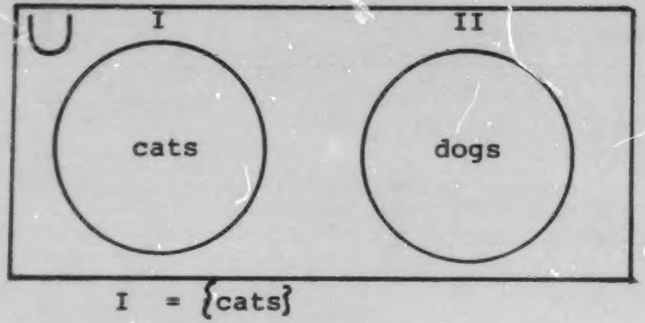
6.14.07 SET NOTATION AND VENN DIAGRAMS

(ongoing)

PERFORMANCE OBJECTIVES

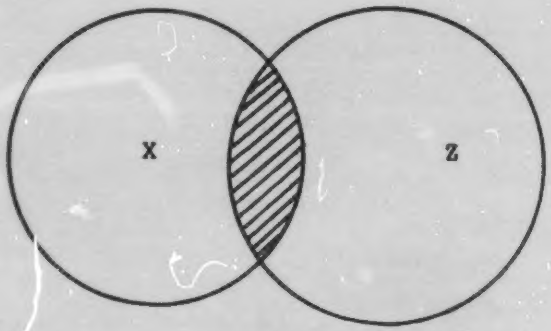
The student will be able to...

6.14.07.01 identify the set which is the union of two finite sets, using Venn diagrams; e.g.,



$I = \{cats\}$
$II = \{dogs\}$
$I \cup II \ \{cats, dogs\}$

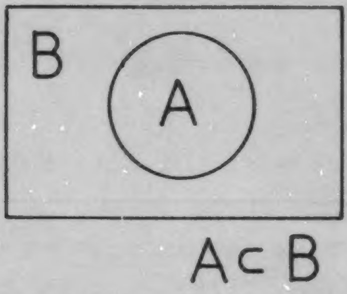
6.14.07.02 identify the set which is the intersection of the two finite sets, using Venn diagrams; e.g.,



$X \cap Z$

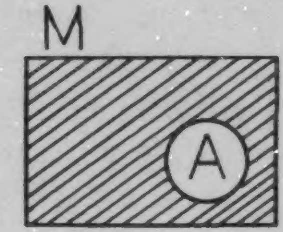
6.14.07.03 use a Venn diagram to show that all the members of subset A are also members of the set B;

e.g.,



6.14.07.04 identify the complement of a set;

e.g.,



The shaded area represents the complement of set A in the universal set M.

6.14.07.05 use set notation and Venn diagrams to illustrate the union and intersection of sets in life situations.

e.g.,

Committees
Types of Weather
Types of Clothing

6.14.07

VOCABULARY

TERMS

union
intersection
subset
Venn diagram
complement

SYMBOLS

$A \cup B$ - A union B
$A \cap B$ - A intersection B

GETTING STARTED

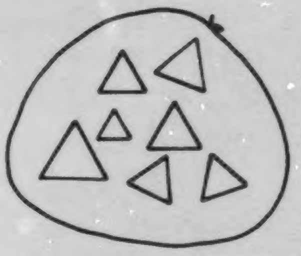
Obtain or prepare a set of attribute cards or blocks for each student or group. Three or four students should work together. The 32 attribute blocks should consist of four shapes (Square, Circle, Triangle and Diamond) that are of four colors (Red, Blue, Green and Yellow) and are of two sizes (Big and Small).

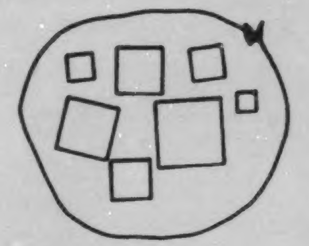
Give each student, or group, his/her own set of blocks and string to make loops.

Say, "Spill out the contents of your box. Make piles of blocks that you feel belong together." Discuss some of the choices.

e.g., John put all the shapes in separate piles.
Mary put everything together that was green. Joan made two piles - everything that was Big and everything that was Small.

Discuss that each classification or set made can be placed inside a loop. Draw these diagrams on the chalkboard to illustrate.
e.g.,



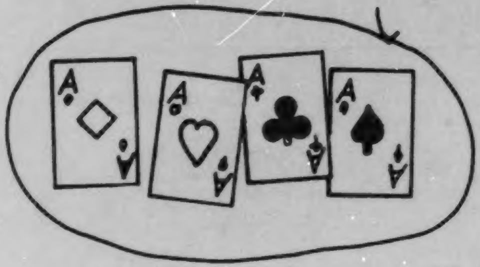


Provide a standard deck of playing cards for each student, or group of students, in your class. Ask the students to remove the cards from the box and place cards with similar attributes together in a

GETTING STARTED cont'd

pile. Discuss some of the sets that were made, for example, the set of Red cards; the set of Black cards; the set of Diamonds; the set of Clubs; the set of Fours; the set of Eights; the set of Kings, etc.

Provide string for the groups to loop their sets. Draw this information on the chalkboard, in the form of Venn diagrams. e.g,

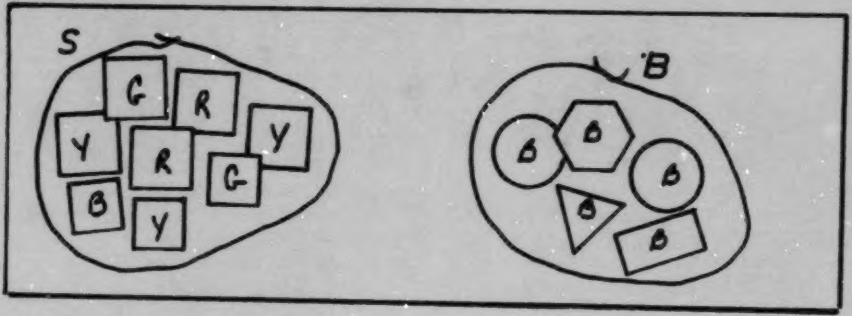


Loop and then draw various sets on the chalkboard that the students have made with the cards.

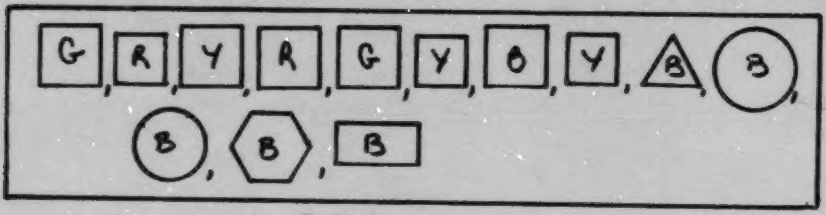
6.14.07

6.14.07.01 **identify the set which is the union of two finite sets, using Venn diagrams**

STRATEGY 1: Using the attribute blocks and loops from the Getting Started activity, ask the pupils to make the set of Squares. Then ask the pupils to loop the set inside the string. Draw the set on the chalkboard.
e.g.,



Say, "The circle that I drew represents the string loop that you made. Let 'S' equal the set of Squares. Let's make a set of Blue attribute blocks and place it in another loop." Say, "Let 'B' equal the set of Blue. The set of Squares and the set of Blue put together is called the union of the two sets. Draw a rectangle enclosing both loops, this shows the unused set of attribute blocks. Ask, "What are the members of the union of Squares and Blue?" List them.



S U B

130

STRATEGY 1: cont'd

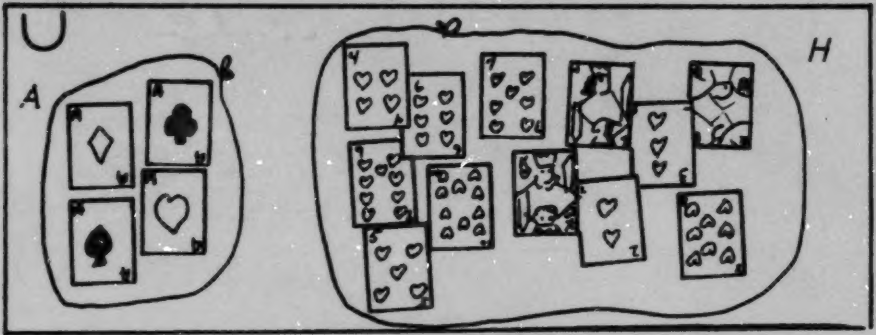
Ask, "How many members are there in the union of these two sets?" (14)

Follow the same procedure to demonstrate the union of the set of Big blocks with the set of Circles.

STRATEGY 2:

Using standard playing cards, ask individual students or groups to make the set of Aces. Place the set in a loop. Say, "What are the members of this set?" (Ace of Hearts, Ace of Diamonds, Ace of Spades and Ace of Clubs.) Write them on the chalkboard in a Venn diagram.

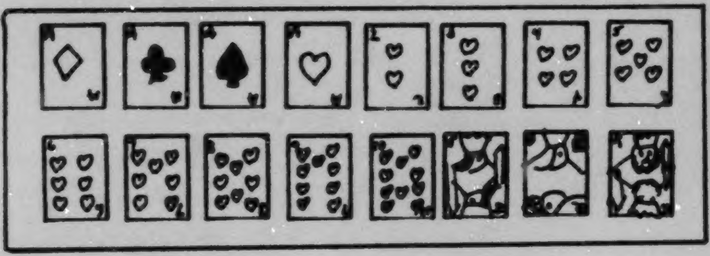
e.g.,



Say, "Let 'A' equal the set of Aces. Make the set of Hearts and place it in another loop." Ask, "How many members are there in the union of the set of Hearts and the set of Aces?" (16) List them, as shown in this example.

e.g.,

AUH =



STRATEGY 2: cont'd

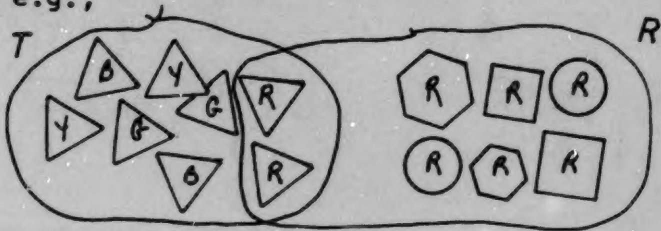
Follow the same procedure to demonstrate the union of the set of picture cards (Jacks, Queens, and Kings) with the set of Red cards.

6.14.07.02 **identify the set which is the intersection of two finite sets, using Venn diagrams**

STRATEGY 1:

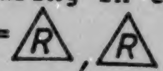
Using attribute blocks, ask the students to make a set of Triangles and a set of Red blocks and ring them with a loop. Ask, "What Venn diagram should I draw on the chalkboard?"

e.g.,



Write on the chalkboard, "Let T = the set of Triangles. Let R = the set of Red blocks."

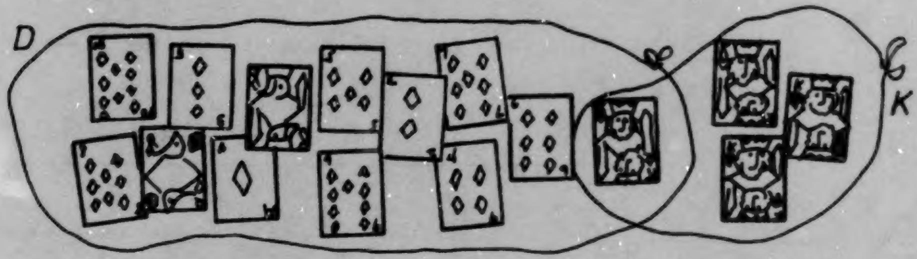
Ask the students to make the set of Red blocks. Ask, "What appears in both sets?" (The Big and Small Red Triangles appear in both sets.) Discuss that the intersection of set T and set R is the set which contains both the Big and Small Red Triangles.

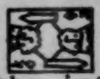
Say, "In a Venn diagram and using our loops, this intersection is shown by overlapping the loops, with the Red Triangles appearing in the overlap. Therefore, Set T $\cap$ Set R = 

Repeat this procedure for the intersection of the set of Small blocks and the set of Circles.

6.14.07

STRATEGY 2: Using standard decks of playing cards, ask the pupils to make the set of Diamonds and loop it with string. Draw the Venn diagram on the chalkboard. e.g.,



Now ask the pupils to make the set of Kings and loop it with string. Elicit that the King of Diamonds appears in both sets. Draw the Venn diagram on the chalkboard, showing the intersection with overlapping circles. Emphasize that the King of Diamonds is in both the set of Diamonds and the set of Kings. Set D $\cap$ Set K = 

Repeat this procedure to show the intersection of the set of Clubs and the set of Two's.

6.14.07.03 **use a Venn diagram to show that all the members of subset A are also members of the universal set C**

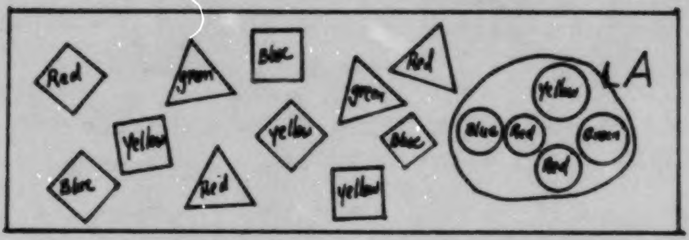
STRATEGY 1: Define the set of attribute blocks as the universal set C. Discuss some of the attributes previously mentioned. Ask the students to make one of these sets, such as the set of Circles and loop this set. Ask, "Where can this set be placed? (The loop for this subset, set of Circles, is placed inside the universal set.) Ask, "What are the members of the set of Circles?" (Large and Small Red, Large and Small

STRATEGY 1: cont'd

Green, Large and Small Yellow, and Large and Small Blue.) Ask, "Are these also members of the set of attribute blocks (set C, the universal set)?" (Yes.)

Draw this on the chalkboard, using a Venn diagram. e.g.,

Set C (Attribute Blocks)


Red
green
Blue
Green
Red
Yellow
yellow
Blue
Red
yellow
Blue
yellow
A
Yellow
Blue
Red
Green
Red

Say, "The Venn Diagram shows the set of circles inside the universal set. Notice that every member of set A is also a member of set C.

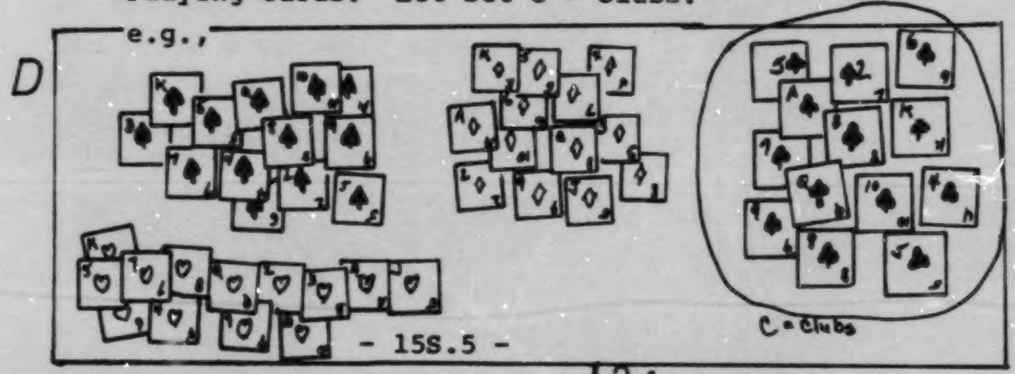
Repeat the same procedure, showing that all the members of the set of Red blocks are also members of the universal set.

STRATEGY 2:

Using a standard deck of playing cards, define all of the cards in the set as the universal set. Ask the students to make the set of Clubs and loop it. Ask, "Is the set of Clubs part of the set of Playing cards? How do we know this?" (Every member of the set of Clubs is also a member of the set of Playing cards.)

Draw the Venn diagram on the chalkboard. Write on the chalkboard, "Let set P = the universal set of Playing cards. Let set C = Clubs."

e.g.,



6.14.07

STRATEGY 2: cont'd

Repeat the procedure, using the subset of Nine's.

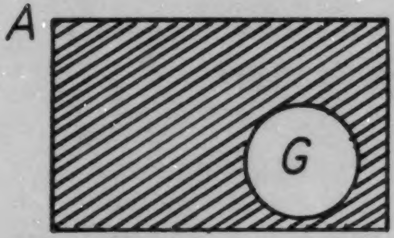
6.14.07.04 **identify the complement of a set**

STRATEGY 1:

Using the attribute blocks once again, identify the universal set as the entire set of blocks. Ask the pupils to make the set of Green. Ask, "What are the members of the set which are not Green?" (The rest of the blocks.)

Ask the pupils to loop the set which is Green with string. Ask, "Where do we place all of the blocks which are not green?" (Outside the loop.) Define this set which is not Green as the complement of the set of Green. Show this with a Venn diagram on the chalkboard. Write on the chalkboard, "Let A = the set of attribute blocks. Let G = the set of Green." All of the blocks which are not Green are drawn in the shaded area and are the complement of the set of Green.

e.g.,

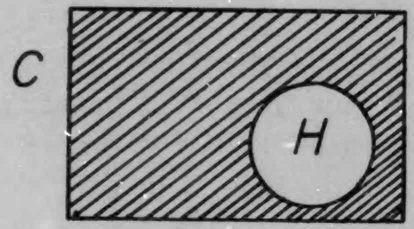


Repeat this procedure by eliciting the complement of each part of these sets:

a) the set of Triangles
b) the set of Small
c) the set of Yellow

STRATEGY 2: Using a standard deck of cards, say, "The universal set is the entire deck of cards." Ask the pupils to make the set of Hearts. Say, "Name a card which is not a member of the set of Hearts." (The Eight of Clubs.) Say, "There is a special name for the set which is not Hearts. This set is called the complement of the set of Hearts." Say, "The members of the complement set are all members which are not in the set of Hearts. They are still members of the universal set of playing cards."

Draw a Venn diagram on the chalkboard.
e.g.,



Write on the chalkboard, "Let C = the set of Playing cards. Let H = the set of Hearts." Say, "The complement of set H is the shaded area. It consists of all the members of the set of cards which are not Hearts."

Repeat the same procedure to show the complement of the set of Jacks.

6.14.07.05 **use set notation and Venn diagrams to illustrate the union and intersection of sets in life situations**

STRATEGY 1: Present the following problem to the class.

There are four Social Studies Committees in a sixth

STRATEGY 1:
cont'd

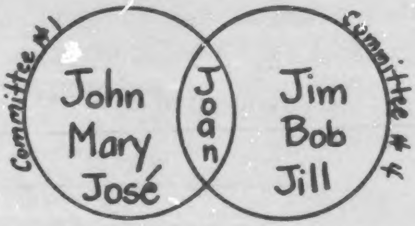
grade class. Write them on the chalkboard:
e.g.,

Committee #1: (John, Joan, Mary, Jose)
#2: (Linda, Steve, Bob, Carol)
#3: (Barbara, Mike, Jerry, Alice)
#4: (Joan, Bob, Jim, Jill)

Committee 1 scheduled a meeting for 9 AM Saturday, at Mary's house and Committee 4 scheduled a meeting at 9 AM Saturday at Jill's house. This caused a problem. Why?

Ask, "What is the problem?" (Joan is a member of both committees and she can't be in two places at the same time.) Ask, "How can we show this very clearly?" (Draw a Venn diagram of the intersection of the two committees.)

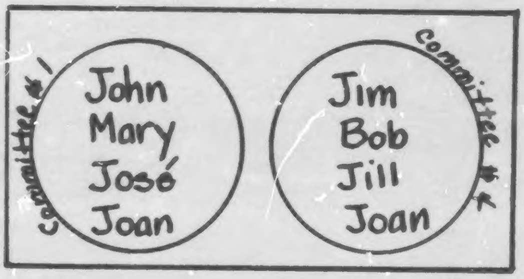
Draw this intersection on the chalkboard:
e.g.,


Committee #1
John
Mary
José
Joan
Jim
Bob
Jill
Committee #4

Ask, "From this diagram, who is on both committees?" (Joan.) "Why can't they have a meeting at the same time?" (Joan can't be two places at the same time.)

Say, "The committees decided to hold a joint planning session. Everyone attended. How many members attended?" (Seven.)

Let's show this union using a Venn diagram.
e.g.,


Committee #1
John
Mary
José
Joan
Jim
Bob
Jill
Joan
Committee #4

STRATEGY 1: cont'd

Ask, "How many children are in the union of the two sets?" (7) Elicit that Joan is only counted once. #1 $\cup$ #4 = (John, Mary, Jose, Joan, Bob, Jim, Jill)

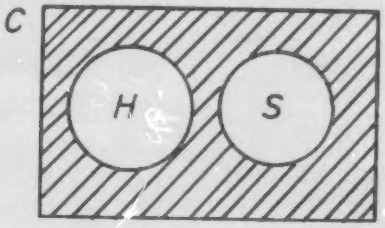
Repeat a similar problem using the fact that Bob is a member of both Committee #2 and Committee #4.

STRATEGY 2: Present the following problem to the class.

> There are 24 students in a sixth grade class. 21 of them wore sneakers to gym plus 3 wore shoes. Draw a Venn diagram to show those students who wore sneakers and those who wore shoes.

Ask, "What is the Universal Set?" (The Universal Set is the set of all 24 students in the class.) Draw this set on the chalkboard. Write on the chalkboard, "Let set C = the students in the class. Let set S = the students who wore sneakers." "Let set H = the students who wore shoes."

e.g.,



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P.O. 6.14.07.01

NAME:______________________________ CLASS:__________ DATE:________

Directions: Draw a Venn Diagram for each union.

1) $C = \{Don, Joe, Mike\}$

$D = \{Ed, Pete, John\}$

$C \cup D =$

2) $B = \{peas, potatoes, rice\}$

$T = \{carrots, beans, rice\}$

$B \cup T =$

3) $H = \{a, e, i, o, u\}$

$R = \{1, 2, 3\}$

$H \cup R =$

4) $L = \{Erie, Michigan, Huron\}$

$M = \{Superior, Ontario\}$

$L \cup M =$

5) $F = \{butter, eggs\}$

$P = \{cheese, milk\}$

$F \cup P =$

P.O. 6.14.07.02

NAME:____CLASS:__________DATE:_______

Directions: Draw a Venn Diagram to show the intersection.

1) $B = \{1,2,3,4,5\}$ $C = \{4,5,6,7,8\}$ $B \cap C =$

2) $D = \{1,2,4\}$ $E = \{1,2,4,8\}$ $D \cap E =$

3) $P = \{$Ann, Mary, Jane$\}$ $S = \{$Alice, Jane, Lucy$\}$ $R \cap S =$

4) $J = \{$The set of Jacks$\}$ $R = \{$The set of Red$\}$ $J \cap R =$

P.O. 6.14.07.03

NAME:____CLASS:__________DATE:________

Directions: Use a Venn Diagram to illustrate each statement.

1) All the green blocks are members of the set of attribute blocks.

2) All the diamond shapes are members of the set of attribute blocks.

3) All Queens are members of the set of playing cards.

4) All picture cards are members of the set of playing cards.

P.O. 6.14.07.04

NAME: ______________________________ CLASS: __________ DATE: ________

Directions: Draw a Venn Diagram to help you find the complement of each set.

1) If Set A is the set of blue triangles, what is the complement of set A if the universal set is the set of attribute blocks?

2) What is the complement of Set B if Set B = {1,4,9} and the universal Set A = {1,2,3,4,5,6,7,8,9} ?

3) What is the complement of Set M, if Set M = {a,e,i,o,u} and the universal Set C = {the letters of the alphabet} ?

P.O. 6.14.07.05

NAME:____________________ CLASS:________ DATE:_______

Directions: Draw a Venn Diagram to show each situation.

1) There are twelve members on the basketball team. Eight of them have played in every game this season.

2) There are twenty-nine pupils in the class. Sixteen are boys.

3) There are twenty-nine pupils in the class. Maria, Joyce and Carole are on the Social Studies Committee. Edith, Ann and Joyce are on the Science Committee.

Unit 9

6.11.01 OPEN SENTENCES AND SOLUTION SETS

(2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.11.01.01A define and recognize an open sentences using variables and equal (=) symbols; e.g.,

$\square + 8 = 12$ $x + 5 = 9$

$a - 4 = 9$ $y - 8 = 10$

6.11.01.02A define equivalent open sentences as equations having the same solution set. e.g.,

$\square + 7 = 9$ $x - 4 = 3$

$\square + 8 = 10$ $x - 5 = 2$

6.11.01

VOCABULARY

TERMS

equation
open sentence
variable
solution set
equivalent

GETTING STARTED

Write the following on the chalkboard.

$\square + 6 = 12$ $\qquad$ $\square - 5 = 6$

$\square + 3 = 7$ $\qquad$ $\square - 4 = 10$

Ask the students to fill in the missing number. Repeat with other problems of the same type.

Ask the student to use a function box to find the missing number.

+6

in	out
?	9
?	10
?	14

-5

in	out
?	5
?	8
?	12

Repeat with problems of the same type.

6.11.01

6.11.01.01 **define and recognize an open sentence using variables and equal (=) symbols**

STRATEGY 1: Write the following sentences on the chalkboard:

1. George Washington was president of the U.S.
2. The Empire State Building is the tallest building in New York City.
3. He is a pupil in this classroom.
4. 6 + 7 = 13
5. 8 + 3 = 15
6. □ + 5 = 9
7. x + 4 = 7

Ask the students to answer true or false to each sentence. Elicit that questions 3,6,7 cannot be answered true or false. Tell the students these are called open sentences.

Ask the students, "What makes sentences 3,6 and 7 an open sentence?" Elicit, "He, □ and x."

Tell the students that these words and symbols are called variables. When the variables are replaced by names or numbers the sentences is not longer open and it is possible to tell whether it is true or false. Repeat this procedure with other sentences both true and false.

STRATEGY 2: Write the following on the chalkboard:

1. 4 + 9 = 13 y + 9 = 13

Tell the students that a mathematical sentences with the symbol (=) is an equation. Ask a student if the equation 4 + 9 = 13 is true? Elicit yes. Ask a student if y + 9 = 13 is a true sentence. Elicit that you cannot tell. The letter y is used as a place-holder and is called a variable.

STRATEGY 1: When the variable is replaced by a number it will then be possible to tell whether the sentence is true or false. Repeat this procedure with other equations.

e.g.,

(1)	(2)
$7 + 2 = 9$	$y + 4 = 9$
$8 + 5 = 11$	$x + 9 = 11$
$6 + 4 = 10$	$a + 3 = 4$
$8 - 5 = 14$	$b - 6 = 7$
$11 - 4 = 7$	$c - 3 = 11$

Tell the students that the equations in column 1 can be judged true or false and are called statements. The sentence in column 2 cannot be judged true or false and are called open sentences. Elicit statements and open sentences from the class.

6.11.01.02 **define equivalent open sentences as equations having the same solution set**

STRATEGY 1: Write the following open sentences on the chalkboard:

A	B
$x + 3 = 5$	$y - 6 = 4$
$x + 4 = 6$	$y - 5 = 5$
$x + 5 = 9$	$y - 4 = 6$

Ask the students to find the number that will make each equation true. Elicit that in column A the number that will make each equation true is 2. This is called a solution set. Say to the students the number which makes an open sentence true is called the solution set. Therefore, the solution set for the open sentences in column A equals (2).

STRATEGY 1: cont'd

Ask the students, "What do the open sentences in column A have in common?" Elicit that they have the same solution set. Tell the students that equations that have the same solution set are called equivalent equations.

Repeat this procedure with the open sentences in column B and with other sets of equivalent equations.

STRATEGY 2:

Divide the class into two teams. Write a series of equations on oaktag.
e.g.,

Team 1	Team 2
a + 4 = 8	b - 4 = 6
a + 3 = 7	b - 3 = 7
a + 2 = 6	b - 2 = 8
a + 1 = 5	b - 1 = 9

Make up a series of index cards with the numbers 1-10 on them. Make at least 5 cards for each number. Use scotch tape on the index cards to cover the variable with the number that will make each sentence true. The team to finish first is the winner. Tell the students that the number which makes the sentence true is called the solution set. Elicit that the solution set in each equation for the winning team is the same. Tell the students that when equations have the same solution set they are called equivalent equations. Repeat this procedure for the equations for the losing team. (Let the losing team finish their set of equations). Repeat this procedure with other sets of equivalent equations. Keep the solutions sets less than 11.

P.O. 6.11.01.01

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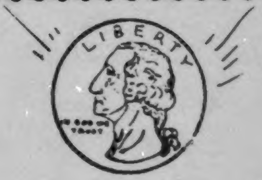


What fruit is on a quarter?

Use the decoding chart to answer this riddle. Find the answer in the Decoding Chart. Use the letter for that answer in the space above the question number at the bottom. When all eight problems are done, the answer to the riddle will be spelled out. Replace the variable with the number that will make each sentence true.

(1) $a + 24 = 76$

(2) $34 + b = 56$

(3) $b + 19 = 42$

(4) $100 - y = 49$

(5) $42 - Y = 8$

(6) $31 + a = 110$

(7) $96 - a = 44$

(8) $a + 27 = 50$

22	H
23	L
34	D
50	U
51	
52	T
61	J
77	G
79	A
89	N
90	S
100	O
140	R
149	P
150	L

____ ____ ____ ____ ____ ____ ____ ____
1 2 3 4 5 6 7 8

P.O. 6.11.01.02

NAME: ______________________ CLASS: ________ DATE: ________

Why do cows wear bells?

Circle the correct answers below. The letters of the correct answer spell out the answer to the riddle above.

I. Circle the equation.

1. R) $19 - x$ S) $6 + x$ T) $4 + a = 12$
2. H) $x + 2 = 8$ I) $19 - 4$ J) $x + 6$
3. D) $x + 11$ E) $19 - x = 9$ F) $x + 3$
4. H) $5 + a$ I) $5 + a = 8$ J) $5 + a$
5. Q) $19 - y$ R) $19 - y = 2$ S) $19 - y2$

II. Circle the equation that is not equivalent to the other two.

6. H) $x + 3 = 9$ I) $9 + x = 16$ J) $2 + x = 9$
7. M) $14 - x = 7$ N) $27 - x = 20$ O) $x + 8 = 16$
8. R) $x + 17 = 23$ S) $3 + x = 10$ T) $x - 5 = 2$
9. M) $15 - x = 8$ N) $10 - x = 4$ O) $11 + x = 18$
10. R) $x + 3 = 10$ S) $x + 9 = 15$ T) $x - 3 = 4$

*
11. D) $2a = 12$ E) $5a = 35$ F) $7c = 49$
12. M) $4b = 28$ N) $8d = 56$ O) $3b = 18$
13. M) $3c = 21$ N) $7y = 42$ O) $5a = 35$
14. R) $4y = 28$ S) $2x = 14$ T) $5x = 30$

(*2a means 2 times a number)

P.O. 6.11.01.02

NAME: ______________________ CLASS: __________ DATE: ________

15. W) $5x = 30$ X) $6x = 42$ Y) $x = 9 = 16$

16. M) $x + 4 = 11$ N) $4x = 28$ O) $x - 2 = 4$

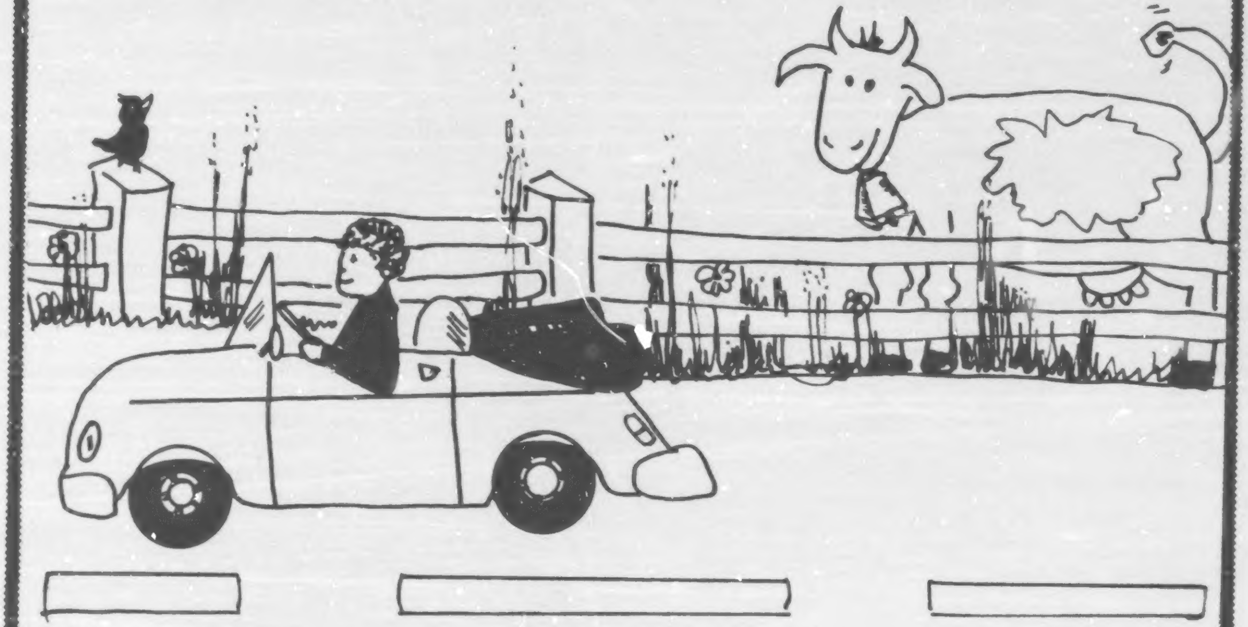
17. R) $x + 7 = 13$ S) $x - 7 = 0$ T) $3x = 21$

18. J) $x - 1 = 6$ K) $5x = 30$ L) $x + 1 = 8$

WHY DO COWS WEAR BELLS?

Because ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
1 2 3 4 5 6 7 8 9 10

___ ___ ___ ___ ___ ___ ___ ___
11 12 13 14 15 16 17 18



6.01.02 EXPONENTS

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.01.02.01A identify and rename a numeral with an exponent as a numeral in standard form; e.g.,

$$2^3 = 2 \times 2 \times 2 = 8$$
$$8^5 = 8 \times 8 \times 8 \times 8 \times 8 = 32,768$$

Note: Only small integer exponents (up to $n^{\underline{5}}$) should be used.

6.01.02.02B identify and rename any non-zero number to the zero power as one. e.g.,

$$5^0 = 1; \quad 8^0 = 1$$

6.01.02

VOCABULARY

TERMS	SYMBOLS
exponent	$n^2 = n \times n$
power	2 <——— power
factor	n <——— base
standard numeral	
algorithm	
product	

GETTING STARTED

Construct cards which are divided into sixteen boxes. Each box will contain a multiplication algorithm. No two cards should be exactly alike.

e.g.

6 x 7 = 42	9 x 5 = 45	4 x 4 = 16	8 x 7 = 56
9 x 2 = 18	5 x 5 = 25	8 x 4 = 32	3 x 3 = 9
5 x 3 = 15	7 x 7 = 49	4 x 3 = 12	9 x 7 = 63
6 x 6 = 36	8 x 2 = 16	4 x 5 = 20	6 x 4 = 24

Note: The answers should not appear on the student cards. It appears in the above example only as teacher reference.

Blue chips or small squares of construction paper should be distributed to the students.

Say, "We are going to review our multiplication facts by playing Timo. Look at your card. I will say a number aloud. If the number is the product and completes a multiplication algorithm that you have on your card, place a marker on the box. Sometimes the product will complete two algorithms. In that case, place two markers on the card, one on each completed algorithm. When you have covered all the boxes on your card, you have won the game."

GETTING STARTED cont'd

Say, "We are going to learn to write numbers in a different form."

Write 2 x 2 = 4 on the chalkboard.

Ask, "In the number sentence 2 x 2 = 4, how many 2's are written?" Response should be two. Say, "The number four may also be represented as 2^2."

"Ask a student to point to the number 2^2. Say, "Now point to the number which indicates how many times two is used as a factor in 2^2."

Repeat this procedure to complete the following chart on the chalkboard:

Exponential Form	Simple Product
$2^2 = 2 \times 2$	= 4
$2^3 = 2 \times 2 \times 2$	= 8
$2^4 = 2 \times 2 \times 2 \times 2$	= 16
$2^5 = 2 \times 2 \times 2 \times 2 \times 2$	= 32

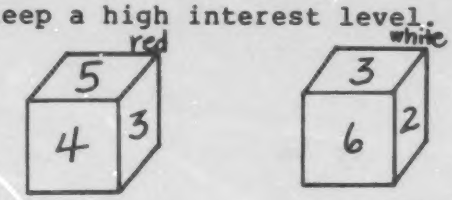
6.01.02

6.01.02.01 **identify and rename a numeral with an exponent, as a numeral in standard form**

STRATEGY 1: Write 3^2 on the chalkboard. Ask, "Who can put a box around the numeral?" "Circle the exponent?" Say, "We read this as three to the second power." Write on the chalkboard, $3^2 = 3 \times 3$. Say, "We can represent this by the algorithm 3 x 3." Ask, "3 x 3 is equal to what number?" (9)

Divide the class into groups of four students. Distribute a red and a white dice to each group. Say, "The red dice will represent the numeral and the white dice will represent the exponent. Each of you will take a turn shooting both dice. You will then record the numeral and its exponent, and figure out the standard numeral it represents. For each correct answer, you will score one point." Limit the game to five or less turns per student in order to keep a high interest level.

e.g.,



$$5^3 = 5 \times 5 \times 5 = 125$$

STRATEGY 2: Draw two columns on the chalkboard. The first column title "EXPONENT." The second column title "STANDARD NUMERAL." Students will then match the exponent with the appropriate standard numeral by drawing a connecting line. Do the first example with the class.

6.01.02

STRATEGY 2: cont'd

e.g.,

EXPONENT		STANDARD NUMERAL
3^2	⟷	9

Say, "Please copy and complete the following chart by drawing arrows to match the EXPONENT to the STANDARD NUMERAL."

EXPONENT	STANDARD NUMERAL
5^3	256
2^5	81
4^4	3
8^4	10,000
9^2	125
6^5	7,776
10^4	343
3^1	32
7^3	4,096

6.01.02.02 **identify and rename any non-zero number to the zero power as one**

STRATEGY 1: Ask, "What does the power of a number show us?" (The power of a number shows us how many times a number is used as a factor. A number to the zero power is equal to 1.)

e.g., $5^0 = 1$

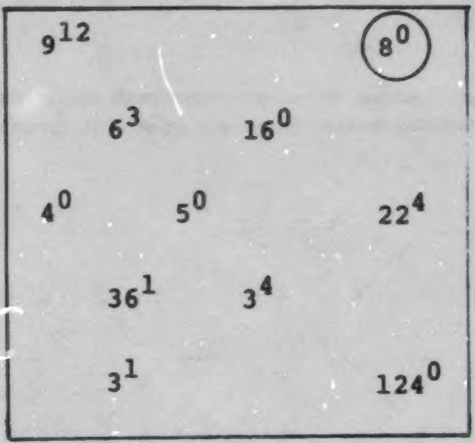
$8^0 = 1$

$12^0 = 1$

Draw a square on the chalkboard. Write different numbers with exponents in the square. Ask various students to circle any number with an exponent which equals one.

STRATEGY 1: cont'd

e.g.,



You may repeat this procedure using other examples, or you may have the students create their own examples.

STRATEGY 2: Using $8\frac{1}{2}$" x 11" unlined paper, write various non-zero numbers to the zero power on approximately 10 through 20 sheets. Tape these sheets on different walls of the classroom.

Say, "We're looking for numbers with exponents which equal one. Look around the room and tell us if you see any numbers which equal one." Select a student who had located a number sheet. Ask him/her to remove the sheet from the wall and tape it on the chalkboard. Continue until all the sheets are taped on the chalkboard.

You can vary this procedure by using different numerals with exponents to a power other than zero. When the students tape the sheets to the chalkboard, the rest of the class can then compute the standard numerals for all the examples found.

P.O. 6.01.02.01

NAME: ______________________ **CLASS:** ________ **DATE:** ________

Directions: Rename the numeral with an exponent as a numeral in standard form.

$3^2 = 9$	$4^5 =$ ___	$6^3 =$ ___	$9^4 =$ ___	$8^0 =$ ___
$4^4 =$ ___	$3^5 =$ ___	$8^3 =$ ___	$3^4 =$ ___	$6^1 =$ ___
$5^3 =$ ___	$10^5 =$ ___	$6^2 =$ ___	$7^0 =$ ___	$8^1 =$ ___
$9^1 =$ ___	$12^2 =$ ___	$5^4 =$ ___	$3^5 =$ ___	$3^{10} =$ ___
$6^2 =$ ___	$7^1 =$ ___	$4^2 =$ ___	$8^5 =$ ___	$10^7 =$ ___
$5^2 =$ ___	$7^3 =$ ___	$6^3 =$ ___	$3^3 =$ ___	$4^1 =$ ___

P.O. 6.01.02.02

NAME:____ CLASS:__________ DATE:_________

I. Write the standard numeral for each exponent.

A

Exponent	5^0	5^1	5^2	5^3	5^4	5^5	5^6	5^7	5^8
Standard Numeral									

B

Exponent	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^8	10^9	10^{10}
Standard Numeral											

C

Exponent	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9	2^{10}
Standard Numeral											

II. Write the exponent for each standard numeral.

D

Exponent	10^1								
Standard Numeral	10	100	1,000	10,000	100,000	1,000,000	10,000,000	100,000,000	1,000,000,000

E

Exponent	3^0								
Standard Numeral	1	3	9	27	81	243	729	2,187	6,561

6.01.03 PRIME NUMBERS

(3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.01.03.01A identify a prime number as a whole number greater than one having only two factors e.g.,

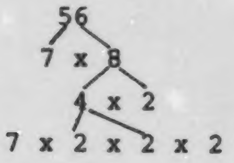
2,3,5,7,13, etc.

6.01.03.02B identify a composite number as any whole number having more than two factors; e.g.,

16, 100, 50, 27

Note: The number one is not considered to be composite or prime.

6.01.03.03B determine the prime factorization of any composite number; e.g.,



$56 = 7 \times 2 \times 2 \times 2$

$56 = 7 \times 2^3$

$$\begin{aligned} 56 &= 7 \times 8 \\ &= 7 \times 2 \times 4 \\ &= 7 \times 2 \times 2 \times 2 \\ &= 7 \times 2^3 \end{aligned}$$

6.01.03.04B rename a composite number as a product of its primes. e.g.,

$16 = 2 \times 2 \times 2 \times 2 = 2^4$

$18 = 2 \times 3 \times 3 = 2 \times 3^2$

6.01.03

VOCABULARY

TERMS

factor
prime number
composite number
prime factorization
inverse operations

GETTING STARTED

Say, "A prime number is a whole number greater than one having only 2 factors."

Ask, "Is the number 5 a prime number? Why or why not?" (Yes, because its only factors are 5 and 1.)

"Is the number 8 a prime number? Why or why not?" (No, 8 is not prime because the number 8 has four factors - 1,2,4 and 8.)

Follow the same procedure using different numbers.

Write 7 x 3 = 21 on the chalkboard. Ask, "How can we use the same three numbers to express this multiplication problem in other ways?"
e.g.,

3 x 7 = 21, 21 = 7 x 3, 21 = 3 x 7

Ask, "How can we write the related division examples?"
e.g.,

21 ÷ 7 = 3, 21 ÷ 3 = 7, 3 = 21 ÷ 7, 7 = 21 ÷ 3

Remind students that multiplication and division are inverse operations or opposites. Ask, "How can we check the answers to the following examples?"
e.g., 7 x 3 = 21

$\begin{array}{r} 7 \\ 3\overline{)21} \end{array}$ or $\begin{array}{r} 3 \\ 7\overline{)21} \end{array}$

21 ÷ 3 = 7
21 ÷ 7 = 3
7 = 21 ÷ 3

GETTING STARTED cont'd

Draw the array on the chalkboard. Ask the students to copy it.
e.g.,

```
XXX
XXX
XXX
XXX
XXX
```

Ask, "What multiplication example can we write to show the number of X's?" (5 x 3)

Ask the students to copy the set again. Ask, "What is another multiplication example we can write to show the number of X's?" (3 x 5 = 15)
e.g.,

```
X X X X X
X X X X X
X X X X X
```

Follow the same procedure using other factors.

6.01.03

6.01.03.01 identify a prime number as a whole number greater than one having only two factors

STRATEGY 1: Sieve of Eratosthenes

1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99
10	20	30	40	50	60	70	80	90	100

Give each student one piece of graph paper. Ask them to outline a box of 10 x 10 squares. Draw the Sieve of Eratosthenes (e-ra-tos-tha-nEz) on the chalkboard and ask the students to similarly fill in their boxes.

Say, "Leave the first space blank for number 1 since 1 is not a prime number. Begin with number 2. Since 2 is a prime number, circle it. Cross out each numeral after the number 2 which represents a number that is divisible by 2.

The next numeral which is not crossed out is 3. Since 3 is a prime number, circle it. Continue crossing out all the numerals after 3 which are divisible by 3. If a numeral has already been crossed out, ignore it and continue.

After 3 the next numeral which is not crossed out is 5. Since 5 is a prime number, circle it. Continue crossing out all the numerals after 5 which are divisible by 5."

Continue this procedure until there are no more numerals to be crossed out.

STRATEGY 2: All the circled numerals are prime numbers. A prime number is a number which has only two different whole number factors: The number can be divided by itself and by one (e.g., 3 and 5 are prime numbers). Ask, "How many prime numbers did you find?" (There are only 25 prime numbers.) Display partially filled in calendar at chalkboard.

SUN	MON	TUES	WED	THUR	FRI	SAT
▭	△	○	△△			

Discuss that there are no numbers as we know them on this calendar.

Point to the ▭ Say, "What number does this represent? (1) Point to the △ and ask, "What number does this represent? (2) Point to the ○ and ask, "What number does this represent?" (3) Ask, "What is the symbol we used for 2?" (△) "Why do you think we used 2△'s for 4?" (Because 2 x 2 = 4)

Ask, "Can we use any of the symbols we have previously used to make 5?" (No, because 5 only has 2 factors 5 and 1, therefore it is a prime number and we have to use a new symbol.)

Ask a student to come to the calendar and make up a symbol for 5. Ask, "Can we use any of the previous symbols for 6?" (Yes 2 x 3 = 6) Have a student come to the chalkboard and write △○ in the space where the 6 belongs. Continue until you have completed the calendar.

6.01.03.02 **identify a composite number as any whole number havinmg more than 2 factors**

STRATEGY 1: Write numbers 1-12 on the chalkboard.

1	2	3	4	5	6
7	8	9	10	11	12

Have various children come to the chalkboard and write factors under the number.
e.g.,

(4)	(7)
2 x 2	7 x 1
4 x 1	

When the chart is completed, children will see that certain numbers (4,6,8,9,10,12) had more than 2 factors.

Say, "Numbers greater than 1 which have more than 2 factors are called composite number."

Ask children, "What is the next composite number after 12?" (14) "Why?" (Because 14 has factos 7 x 2, 14 x 1) Ask children, "Which numbers between 20 and 25 are composite number?" (21,22,24)

STRATEGY 2: Prepare cards 1-100. Start with card number 5. Hold card up and ask, "What are the factors of 5?" (1 and 5) "Five is called a prime number because it only has 2 factors, one and itself."

Hold up any other card, e.g., 18. Ask, "What are the factors of 18?" (2,3,6,9,18,1) "We call 18 a composite number because it has more than 2 factors."

Divide class into teams. Each team earns a point for each factor of a number it can name.

6.01.03

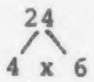
STRATEGY 2: cont'd

e.g., If the card 16 was held up and the team was able to name 1,2,4,8,16 as the factors of 16, that team would have earned 5 points. First team to score 21 points wins the game.

6.01.03.03 **determine the prime factorization of any compound number**

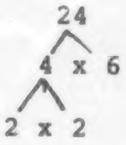
STRATEGY 1: Write 24 on the chalkboard. Ask children to name two factors of 24, e.g., 6 x 4. Draw a diagram on the chalkboard.

e.g.,



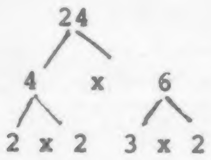
Elicit from the students that 4 and 6 are not prime numbers. Ask, "Can we factor 4?" (Yes, 2 x 2) Show on a diagram.

e.g.,



Elicit from students that 2 is a prime number and cannot be factored further. Ask, "Can we factor 6?" (Yes 3 x x) Show on a diagram.

e.g.,



Ask, "Are 3 and 2 prime number?" (Yes) Therefore students can see that the prime factors of 24 are 2 x 2 x 3 x 2.

STRATEGY 1: cont'd

Ask students, "Are these factors in proper counting order?" (No) Elicit that these factors can be rewritten as 2 x 2 x 2 x 3.

STRATEGY 2:

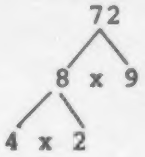
Prepare several index cards of composite numbers.
e.g.,

72, 84, 56, 54 etc.

Divide class into 2 teams. Select composite cards from box, e.g., 72. Paste on the chalkboard.

72

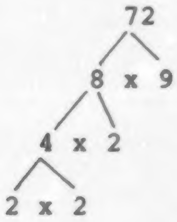
Member of first team comes to the chalkboard and writes 2 factor of 72.
e.g.,



Ask are these prime numbers? (No)

Member of second team comes to the chalkboard and draws a factor of one of the numbers, e.g., 8. Ask what are these prime numbers. (Elicit that 2 is a prime number but 4 and 9 are not.)

Second member from team one, now has the opportunity to factor one of the remaining non-primes, e.g., 4.
e.g.,

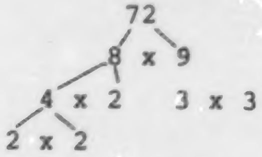


Ask are all the numbers left primer numbers. Elicit that 9 is not a prime number.

6.01.03

STRATEGY 2: cont'd

Ask members of team two to come to the chalkboard and factor 9.
e.g.,



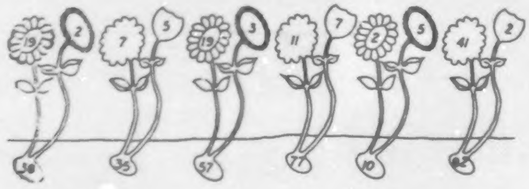
Ask, "Are all the factors left prime?" Elicit yes. Team two has completed factor five and scores one point.

Repeat this procedure with other composite numbvers until one team accumulates 3 points.

6.01.03.04 **rename a composite number as a product of its primes**

STRATEGY 1: Say, "Numbers that are greater than 1 and are not prime numbers are called composite numbers."
Ask, Is the number 15 a prime number?" Why or why not?" (No. It has factors other than 15 and 1; for example, 3 x 5.)

Say, "Let's plant a number seed and see what two prime numbers will blossom into a product of 21. We will plant a composite number garden and rename each blossom." On paper, draw a rooted plant with two flowers. Say, "Look at each plant. What two prime numbers can be written in the flowers which will result in the correct product?"
e.g.,



STRATEGY 2: Say, "List some prime numbers."
Elicit a list of various prime numbers from the students.
e.g.,

2
3
5
7
11
13
17
19
23
29
31
37 etc.

Say, "We can multiply any two prime numbers and the resulting product will be a composite number.
Elicit any two prime numbers.
e.g.,

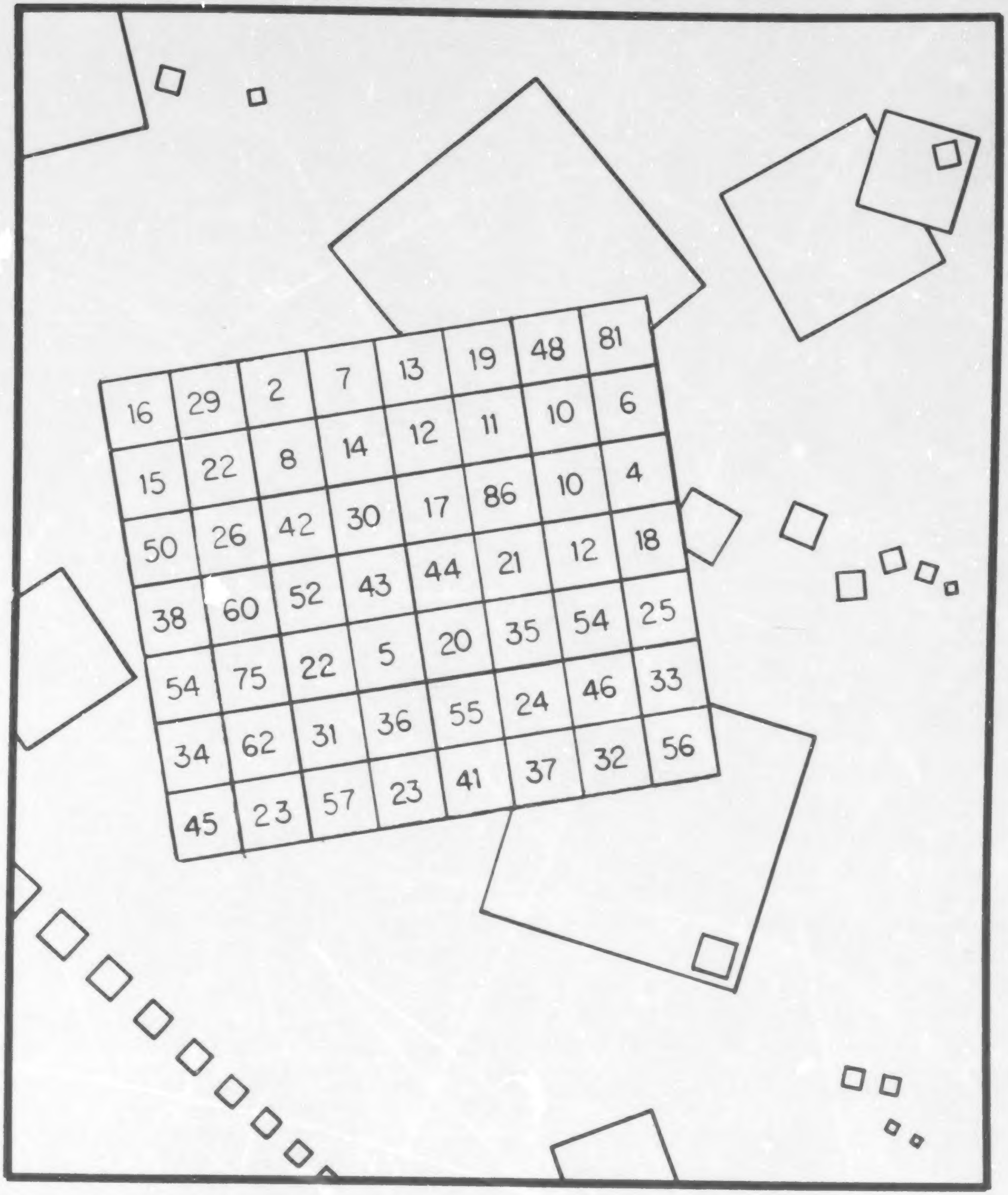
$$2 \times 3 = 6$$

Ask, "Are 2 and 3 both prime numbers? Is 6 a composite number?"

P.O. 6.01.03.01

NAME:______________________CLASS:__________DATE:________

Directions: Place an X on each prime number in this puzzle. Connect all the prime numbers in the puzzle. What prime number will the trail make?

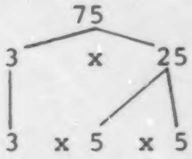


16	29	2	7	13	19	48	81
15	22	8	14	12	11	10	6
50	26	42	30	17	86	10	4
38	60	52	43	44	21	12	18
54	75	22	5	20	35	54	25
34	62	31	36	55	24	46	33
45	23	57	23	41	37	32	56

P.O. 6.01.03. 02

NAME: ______________________ CLASS: __________ DATE: ________

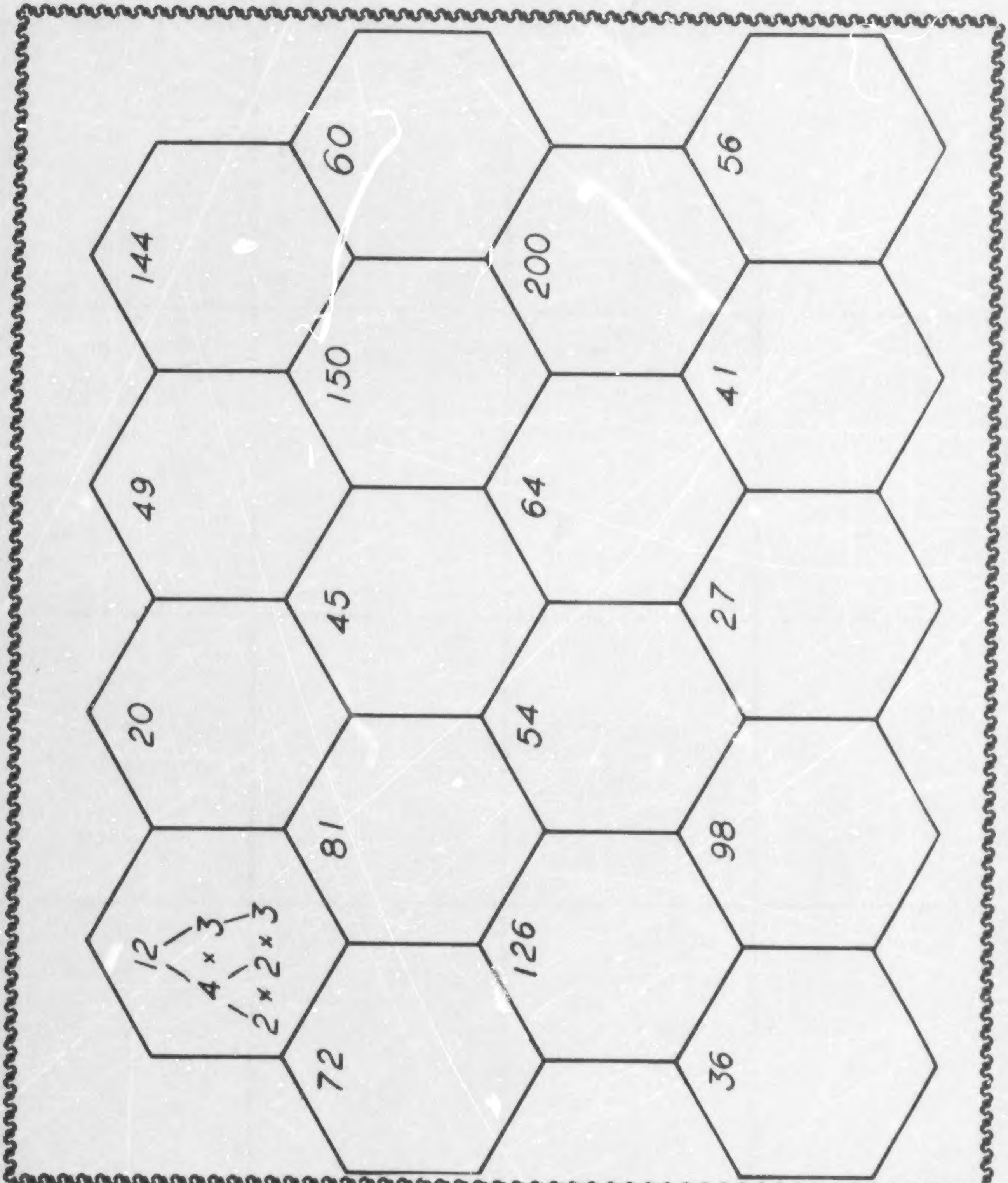
Construct a factor tree for each number. Show each number as a product of primes.

1. 	66	48	150
56	72	63	300
27	98	64	81
42	45	32	50

P.O. 6.01.03.03

NAME: ______________________ CLASS: __________ DATE: ________

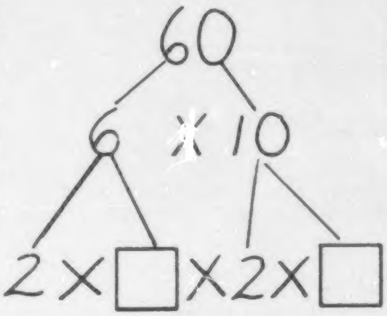
Directions: Give the prime factorization of each number.

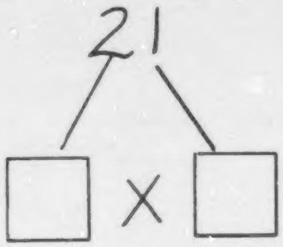

12
4 × 3
2 × 2 × 3
20
49
144
72
81
45
150
60
126
54
64
200
36
98
27
41
56

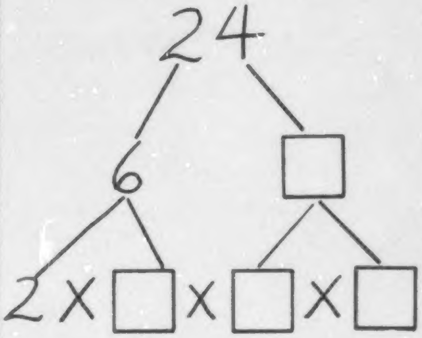
P.O. 6.01.03.04

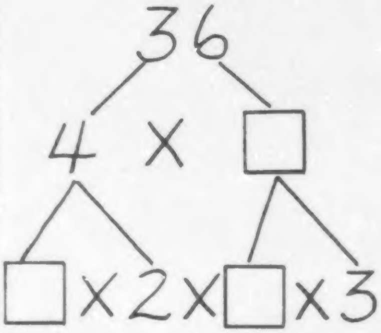
NAME: ______________________ CLASS: __________ DATE: ________

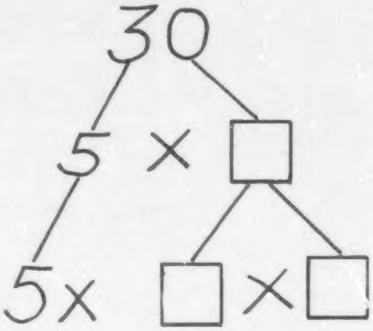
Directions: Complete the factor trees.

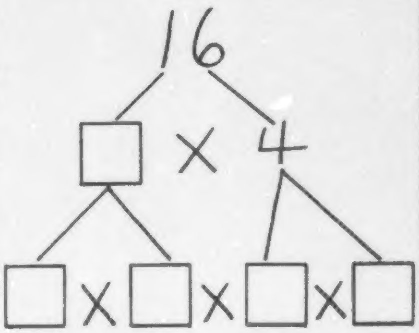


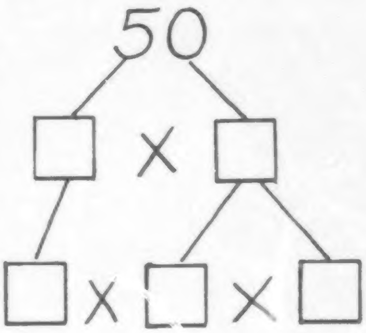


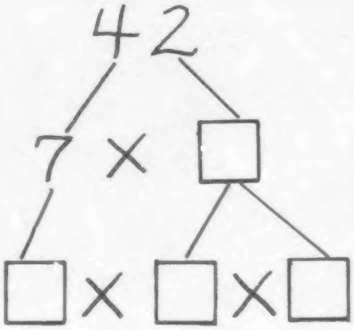


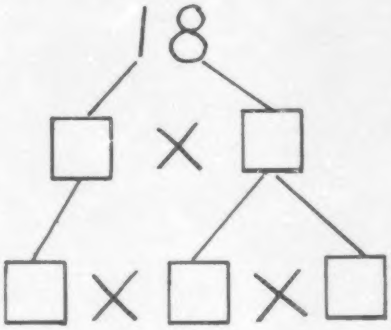












6.13.01 ORGANIZE DATA TO PERCEIVE PATTERNS

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.13.01.01A recognize patterns to solve problems; e.g.,

Hundreds' Chart

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	...							

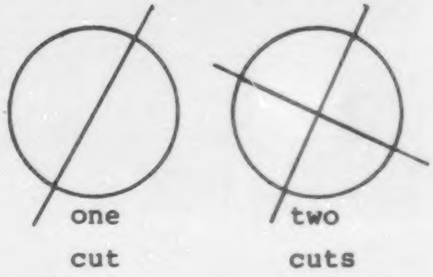
Find patterns on the chart for multiples of 2, 3, 4...

Find a vertical pattern.
Find a horizontal pattern.
Find a diagonal pattern.
Find another pattern.

*6.13.01.02A create a simple chart in order to recognize a pattern;
e.g.,

Peter sliced a pizza pie into two pieces.
Then he sliced them again.

e.g.,



How many pieces are there when the pizza (circle) is sliced by eight diameters?

cut	1	2	3	4	5	6	7	8
number of pieces	2	4	6	8	...			

*6.13.01.03A organize data on a chart to perceive patterns to solve problems.

e.g.,

The youngsters on my block have 15 bicycles and tricycles. The number of wheels on the bicycles and tricycles is 39. How many bicycles and tricycles do the youngsters on my block have?

BICYCLES	TRICYCLES	NO. OF WHEELS
1	14	(1x2) + (3x14) = 44
2	13	(2x2) + (3x13) = 43
3	12	(2x3) + (3x12) = 42
4	11	(2x4) + (3x11) = 41
5	10	(2x5) + (3x10) = 40
6	9	(2x6) + (3x 9) = 39

6.13.01

VOCABULARY

TERMS

multiple
data
chart
table
patterns
diagonal
sequence

GETTING STARTED

Write this number sequence on the chalkboard:

e.g., 7, 11, 15, ___, 23, ___

Ask, "What are the missing numbers in this sequence?" (19, 27) "What is the pattern in this sequence?" (Add 4.) "How did you find the pattern?" (We found the pattern by examining the previous numbers in the sequence and determining what operation occurred between each of the numbers.) Say, "The pattern in a number sequence can be illustrated." Show the pattern by writing this example on the chalkboard.

e.g.,
+4 +4 +4 +4 +4
7, 11, 15, 19, 23, 27...

Write this number sequence on the chalkboard:

e.g., 12, 14, 18, 24, ___, ___

Ask the students to illustrate the pattern and fill in the missing numbers.

e.g.,
+2 +4 +6 +8 +10
12, 14, 18, 24, 32, 42...

Repeat this procedure, using other examples.

e.g.,
+3 +3 +3 +3 +3 +3
3, 6, 9, 12, 15, 18, 21...

+3 +4 +5 +6 +7 +8 +9
9, 12, 16, 21, 27, 34, 42, 51...

+10 -20 +10 -20 +10
50, 60, 40, 50, 30, 40...

6.13.01

GETTING STARTED cont'd

Display this chart.

e.g.,

Numbers	Multiples				
2	2	4	6	8	10
5					
7					
8					
9					
10					
12					

Ask, "What are the first five multiples of 2?" (2,4,6,8,10) "What is the definition of a multiple?" (A multiple is a number which is the product of the given number and another factor.) Ask students to complete this multiples chart. Add the numbers 3, 4, 11, 13 and 15 to the multiples chart and ask the students to list the first five multiples for each.

6.13.01

6.13.01.01 **recognize patterns to solve problems**

STRATEGY 1: Distribute rexographed copy of a hundreds chart to each student.

e.g.,

1	2	3	4	5	6	7	8	9	10
11									
21									
31									
41									
51									
61									
71									
81									
91									

Say, "Find a vertical pattern." (All numbers increase by ten from top to bottom.) "Find a horizontal pattern." (All numbers increase by one from left to right." Ask, "What is a pattern moving diagonally on the chart?" (Diagonally down and to the left is plus nine. Diagonally down and to the right is plus eleven.) Ask the students to identify other patterns they can discover on the chart. (There are many different patterns on the chart.)

STRATEGY 2: Write 11 x 23 on the chalkboard. Ask the students to find the product. Ask one student to do the multiplication at the chalkboard.

e.g.,

$$\begin{array}{r} 23 \\ \underline{\times 11} \\ 23 \\ \underline{230} \\ 253 \end{array}$$

Write 11 x 45 on the chalkboard. Ask one student to do the multiplication at the chalkboard.

6.13.01

STRATEGY 2: cont'd

e.g.,

$$\begin{array}{r} 45 \\ \underline{\times 11} \\ 45 \\ \underline{450} \\ 495 \end{array}$$

Ask the students if they see a way of obtaining the product without multiplying. (We can separate the two digits of the number being multiplied by eleven and place the sum of the digits between them to get our product.)

e.g.,

11 x 71 = 781

Step 1: Separate the 7 and 1.

Step 2: Add and place the sum (8) between the 7 and 1.

Show that this pattern really works, by using other examples.

6.13.01.02 **create a simple chart in order to recognize a pattern**

STRATEGY 1: Read the following problem to the class. Say, "John puts $25.00 into the bank the first month. Each month, he increases his deposit by $10.00. How much money will John have saved after eight months? Use a chart to solve the problem."

Ask, "How many items are we dealing with? (2) Ask, "What are the twc items?" (Number Of Months and Dollars.) Ask, "How many columns should the chart have?" (The chart should have two columns-Number Of Months and Total Saved.) Write the chart on the chalkboard.

e.g.,

Number of Months	1	2	3	4	5	6	7	8
Total Saved	$25							

STRATEGY 1: cont'd

Ask students to fill in the chart until the eighth month is completed.

e.g.,

Number of Months	1	2	3	4	5	6	7	8
Total Saved $	25	60	105	160	225	300	385	480
		+35	+45	+55	+65	+75	+85	+95

Ask, "How much money will John have saved after eight months? ($480.)

Repeat this procedure, using other examples.

STRATEGY 2: Write the following problem on the chalkboard.

> Mary started a new exercise program.
> She began doing five sit-ups a day.
> On Monday of each week, Mary added
> five sit-ups to her daily routine.
> How many weeks will it take Mary to
> reach 65 sit-ups a day?

Use a chart to solve the problem. Ask, "What headings should our chart have?" (The chart should have two headings, Weeks and Sit-Ups.) Write the chart on the chalkboard.

e.g.,

Week	1				
Sit-Ups	5				

Ask students to complete the chart.

e.g.,

Week	1	2	3	4	5	6	7	8	9	10	11	12	13
Sit-Ups	5	10	15	20	25	30	35	40	45	50	55	60	65

Ask, "How long will it take Mary to reach 65 sit-ups?" (13 weeks.)

Repeat this procedure, using other examples.

6.13.01

6.13.01.03 **organize data on a chart to perceive patterns to solve problems**

STRATEGY 1: Write this word problem on the chalkboard.

A parking lot contains twenty-eight cars. The cars are either two-door hardtops or four-door sedans. If there is a total of eighty-two doors in the parking lot, how many two-door and how many four-door cars are there?

Use a chart to solve this example.

Ask, "How many columns will we need? (3) What should be the headings?" (The three columns should be entitled 2-Door, 4-door, Number Of Doors.)"What must the total of 2-door and 4-door cars add up to?" Ask students to fill in one line at a time.

e.g.,

2-Door	4-Door	Number Of Doors
1	27	(1x2) + (27x4) = 110
2	26	(2x2) + (26x4) = 108
3	25	(3x2) + (25x4) = 106
4	24	(4x2) + (24x4) = 104
5	23	(5x2) + (23x4) = 102
6	22	(6x2) + (22x4) = 100
7	21	(7x2) + (21x4) = 98
8	20	(8x2) + (20x4) = 96
9	19	(9x2) + (19x4) = 94
10	18	(10x2) + (18x4) = 92
11	17	(11x2) + (17x4) = 90
12	16	(12x2) + (16x4) = 88
13	15	(13x2) + (15x4) = 86
14	14	(14x2) + (14x4) = 84
15	13	(15x2) + (13x4) = 82

STRATEGY 1: cont'd

Ask, "How many two-door cars were in the parking lot? (15) How many four-door cars were in the lot?" (13)

Repeat this procedure, using other examples from the chart.

STRATEGY 2: Write this problem on the chalkboard.

> A boy is playing an arcade game called "Attacking Satellites." For each attacking satellite destroyed, seven points are awarded. For each attacking satellite damaged, five points are awarded. The boy receives a total of sixty-two points on a total of ten hits. How many satellites were destroyed and how many were damaged?

Use a chart to solve the problem.

Ask, "How many columns are needed?" (Three columns are needed, entitled Hits That Destroyed, Hits That Damaged, and Total Points.) "What should the sum be for the first two columns?" (10) "How do we know when we have our solution?" (When we have sixty-two points.) Write the chart on the chalkboard.

Hits That Destroyed	Hits That Damaged	Total Points
1	9	(1x7) + (9x5) = 52
2	8	(2x7) + (8x5) = 54
3	6	(3x7) + (7x5) = 56
4	5	(4x7) + (6x5) = 58
5	4	(5x7) + (5x5) = 60
6	4	(6x7) + (4x5) = 62

Ask, "What is the solution?" (The boy made six hits that destroyed and four hits that damaged.)

P.O. 6.13.01.01

NAME: ______________________ CLASS: __________ DATE: ________

Directions: Complete the number sequences.

(1) 1, 2, 5, 10, 17, 26

(2) 80, 90, 100, _____, 120

(3) 95, 90, 85, _____, _____

(4) 5, 10, 20, 35, _____, _____

(5) 6, 7, 9, 12, _____, _____

(6) 10, 11, 9, 10, 8, _____, _____

(7) 100, 200, _____, 400, _____

(8) 950, _____, 850, _____, 750, 700

(9) 22, 32, 52, 82, _____

(10) 11, 20, 28, 35, _____, _____

(11) 20, 40, 60, _____, _____

(12) 17, 16, 14, 13, _____, _____

(13) 99, 88, 66, _____

(14) 490, 493, 499, 508, _____

(15) 715, 700, 685, _____, _____

P.O. 6.13.01.02

NAME: ______________________________ CLASS: ________ DATE: _______

DIRECTIONS: Solve these problems.

I. Mary gets an allowance of $5.00 a week. How long will it take her to save $75.00? Construct a chart to solve this problem.

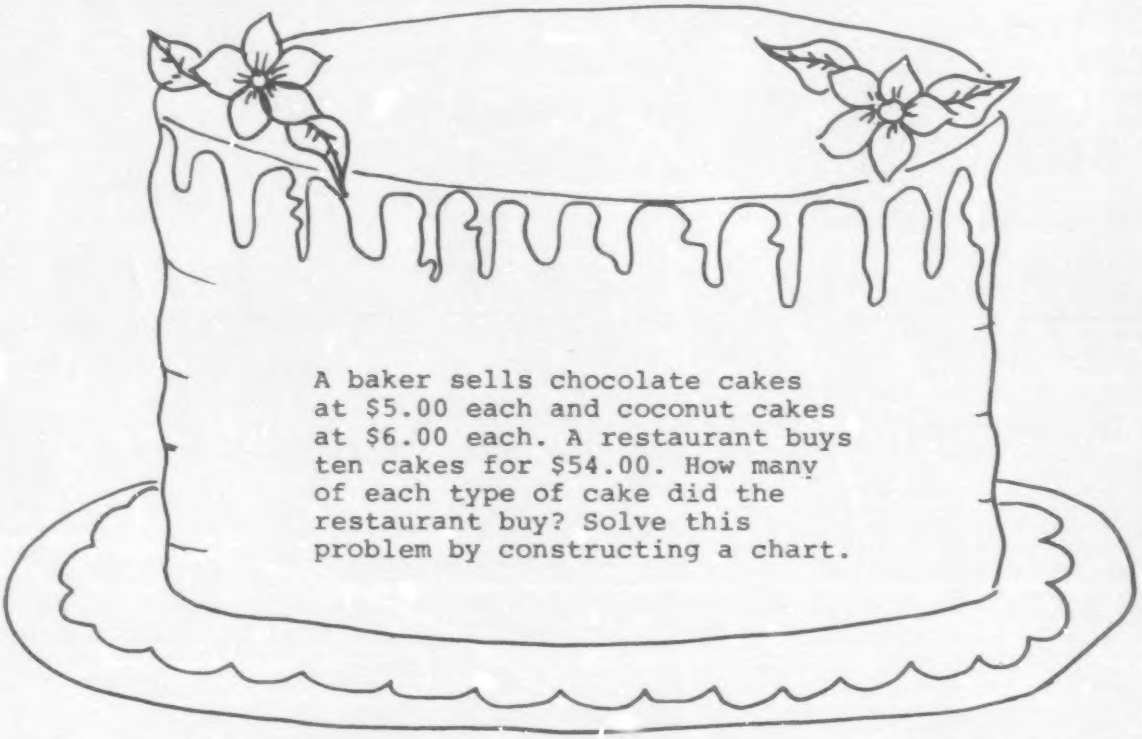
Week																
Money Saved																

II. Bob does 50 pushups a day. At the beginning of each new week he adds 5 pushups. How many weeks will it take him to reach 100 pushups? Construct a chart to solve this problem.

Week																
Pushups																

P.O. 6.13.01.03

NAME:______________________________ CLASS:__________ DATE:________



A baker sells chocolate cakes at $5.00 each and coconut cakes at $6.00 each. A restaurant buys ten cakes for $54.00. How many of each type of cake did the restaurant buy? Solve this problem by constructing a chart.

Chocolate	Coconut	Total
1	9	(1 x 5) + (9 x 6) = $59.00
2	8	(2 x 5) + (8 x 6) =

6.10.01 PERIMETER OF POLYGONS

(3-4 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.10.01.01A find the perimeter of equilateral polygons;

e.g.,

If "P" represents perimeter, and "s" represents the length of a side, then the perimeter of:

a) A square having a 5 in. side =

$P_{\square} = 4 \times s$ or $P_{\square} = 4s$

$P_{\square} = 4 \times 5$ in.

$P_{\square} = 20$ in.

b) An equilateral hexagon having a side of 3 cm =

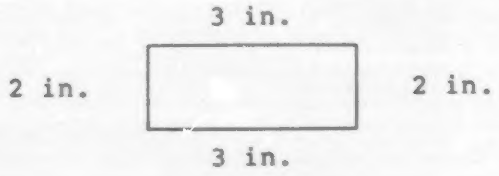
$P_{\bigcirc} = 6 \times s$ or $P_{\bigcirc} = 6s$

$P_{\bigcirc} = 6 \times 3$ cm

$P_{\bigcirc} = 18$ cm

6.10.01.02A find the perimeter of other polygons;

e.g.,



$P_{\boxed{}} =$ length + width + length + width

$P_{\boxed{}} = 2\ (l + w)$

$P_{\boxed{}} = 2\ (3 \text{ in.} + 2 \text{ in.})$

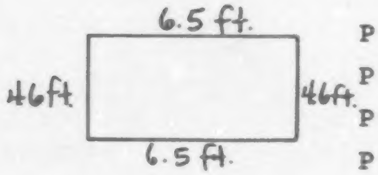
$P_{\boxed{}} = 2\ (5 \text{ in.})$

$P_{\boxed{}} = 10$ in.

6.10.01.03A solve word problems related to skills learned in this module.

e.g.,

Michael wanted to fence in a part of his backyard to make a vegetable garden. He decided to make the garden 6.5 ft. long and 4.6 ft. wide. How much fencing material should he buy?



P▭ = 2(1 + w)
P▭ = 2(6.5 ft. + 4.6 ft.)
P▭ = 2(11.1 ft.)
P▭ = (22.2 ft.)

Michael must buy 22.2 feet of fencing material.

6.10.01

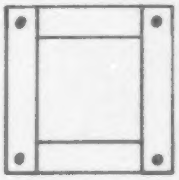
VOCABULARY

TERMS	SYMBOLS
perimeter	P
side	s
length	l
width	w
polygon	
parallelogram	
rhombus	
quadrilateral	
equilateral	
hexagon	
formula	
square	
parallel	

GETTING STARTED

Cut six strips of cardboard 1 inch wide by 3 inches long. Ask each student to connect the four ends with paper fasteners.

e.g.,



Ask the students to form two parallelograms: a square, and a rhombus.

Ask, "Is a square a polygon? Why or why not?" (Yes, a polygon is a simple closed curve made up of line segments.)
Ask, "Is a square a parallelogram? Why or why not?" (Yes, a parallelogram is a quadrilateral whose opposite sides are parallel.)
Ask, "What can you tell us about all four sides?" (All the sides are equal in length).

Follow this procedure when the students make a rhombus.
Ask, "How are a square and a rhombus different in shape?" (A square has four right angles.)

Ask students to add another strip of cardboard to their model.

GETTING STARTED cont'd

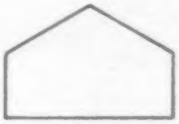
Guide students to make a pentagon.

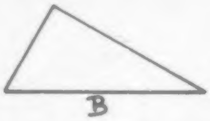
Ask, "Is a pentagon a polygon?" (Yes.)
Ask, "Is a pentagon a parallelogram? Why or why not?"
(No, its opposite sides are not parallel.)

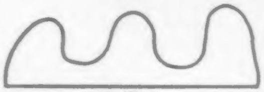
Ask students to add another strip of cardboard (now making six) to their model. Guide students to make a hexagon.
Ask, "Is a hexagon a polygon?" (Yes.)
Ask, "Is a hexagon a parallelogram? Why or why not?"
(No, because its opposite sides are not parallel.)

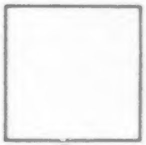
Allow students a few minutes to make and explain different shapes on their own.

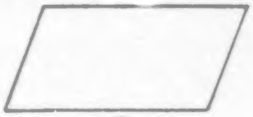
Draw these figures on the chalkboard.
e.g.,

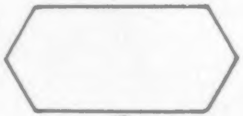

A


B


C


D


E


F

Ask, "Which figures are polygons?" (Figures A, B, D, E and F.)
Ask, "What is a polygon?" (A polygon is a simple closed curve made up of line segments.)
Ask, "Which figures are not polygons? Why?" (Figure C is not a polygon because it has curves in addition to straight line segments.)
Ask, "Which figures are quadrilaterals? Why?" (Figures D and E are quadrilaterals because they both have four sides.)
Ask, "Which figures are parallelograms? Why?" (Figures D and E are parallelograms because their opposite sides are parallel.)

GETTING STARTED cont'd

Ask, "Which figure is a triangle and how many sides does it have?"
(Figure B. It has three sides.)
Ask, "Which figure is a square and how many sides does it have?"
(Figure D. It has four sides.)
Ask, "Which figure is a hexagon and how many sides does it have?"
(Figure F. It has six sides.)
Ask, "Which figure is a pentagon and how many sides does it have?"
(Figure A. It has five sides.)
Ask, "Which figure is a rhombus and how many sides does it have?"
(Figure E. It has four sides.)

If students need more practice, draw another group of shapes for identification.

6.10.01

6.10.01.01 **find the perimeter of equilateral polygons**

STRATEGY 1: Draw a square, an equilateral triangle and an equilateral pentagon on oaktag. Ask the students to cut out these figures. Say, "Let's suppose we have to build a playground in the shape of each figure that you have just cut out. Around each playground is a fence. Our problem is to buy just enough fencing."

Ask, "How can we determine how much fencing is needed?" (Finding out the distance, perimeter, around the polygon.)
Distribute standard or metric rulers. Ask, "You have a ruler and the square figure, how can you measure its perimeter?" (Measure each side.)
Say,"Place a mark at the corner where you start to measure." Allow students enough time to complete their measurements.

Ask, "How did you compute the perimeter of the square?" (Add up all of the sides:
4" + 4" + 4" + 4" = 16 inches.)

Say, "If we use the letter P to represent perimeter and s to represent length of a side, then the formula for the perimeter of a square is $P = s + s + s + s$." Write this formula on the chalkboard.
e.g., $P = s + s + s + s$.

Ask, "How can we change this formula so that we do not have to do four additions?" (Multiply the side four times.) Write on the chalkboard and then substitute numbers.
$P = 4 \times s$ or $P = 4s$.

STRATEGY 1: cont'd

Say, "Since our square measures 4 inches on each side, using our formula we can substitute numbers for the letters."

e.g., $P = 4s$

$P = 4 \times 4$

$P = 16$ inches

Follow this procedure for allowing students to discover the following formulas for the perimeter of: an equilateral triangle, $P = 3s$; an equilateral pentagon, $P = 5s$; and an equilateral hexagon, $P = 6s$.

STRATEGY 2: Draw equilateral polygons in a design on oaktag and distribute one to each student. Distribute yarn to each student. Ask students to find out the distance around each figure. First the students should use the yarn to find the distance around each polygon. Then ask the students to measure each piece of yarn and paste it around the perimeter of each polygon. If available, use different colors for each figure. Allow students to discover the formula for perimeter. Instruct students to complete the following chart, folding their paper into thirds.

e.g.,

Polygon	Length of String	Formulas
1) square		
2) rhombus		
3) pentagon		
4) triangle		
5) hexagon		

For each figure ask, "How did you compute the length of the string for the square?" (I pasted the yarn around the outside of the square.) Say, "The

STRATEGY 2: cont'd

distance around the outside of the square is the perimeter. Add the length of each side of the polygon to find the perimeter."

Write this formula on the chalkboard:

Perimeter = 4 X side

P = 4s

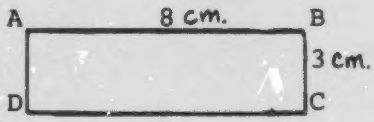
Ask the students to write the formula next to the measurement for a square on their charts.

Follow this procedure, allowing the students to discover the formulas for each equilateral figure in their design.

6.10.01.02 **find the perimeter of other polygons**

STRATEGY 1: Draw this diagram on the chalkboard.

e.g.,



Ask, "What is this figure? (A rectangle.)

Ask, "What is the length of this rectangle? (8 cm)
"What is the width of this rectangle?" (3 cm)

Ask, "If side $\overline{AB}$ is 8 cm, what other side is also 8 cm?" (Side $\overline{DC}$.) Ask, "If side $\overline{BC}$ is 3 cm, what other side is also 3 cm?" (Side $\overline{AD}$.)

Write these measurements on the figure after the students measured it to check their answers.

6.10.01

STRATEGY 1:
cont'd

Ask, "How can we find the perimeter of the rectangle?" (We can add the length of each of the sides.) Ask, "What numbers are we going to add?"

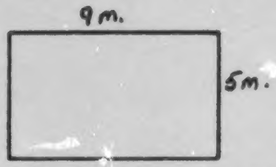
8cm + 3cm + 8cm + 3cm = 22 cm
l + w + l + w = P

Write the answer on the chalkboard.

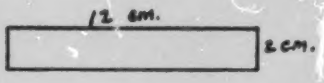
Say, "The formula for the perimeter of a rectangle is P = (2xl) + (2xw).

Ask two students to find the perimeters of the following rectangles.

e.g.,



P = 2l + 2w
P = (2x9) + (2x5)
P = 18 + 10
P = 28m

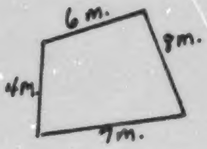


P = 2l + 2w
P = (2x12) + (2x2)
P = 24 + 4
P = 28cm

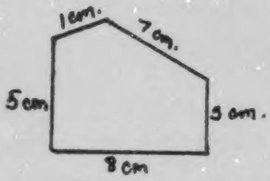
Say, "The perimeter of a polygon is found by adding its sides."

Draw four polygons on the chalkboard and ask the students to find the perimeters.

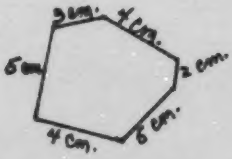
e.g.,



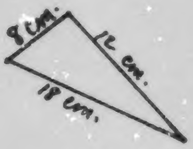
P = 4 + 6 + 8 + 7
P = 25m


1cm.
7cm.
5cm
3 cm.
8cm

P = 1 + 7 + 3 + 8 + 5
P = 24m


3cm.
4 cm.
5cm
2 cm.
5 cm.
4 cm.

P = 5 + 3 + 4 + 2 + 5 + 4
P = 23cm

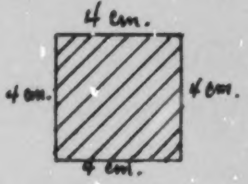

8cm.
12 cm.
18 cm.

P = 8 + 12 + 18
P = 38cm

6.10.01

STRATEGY 2: Draw ten to twenty polygons on 8'x10" drawing paper or oaktag with measurements.

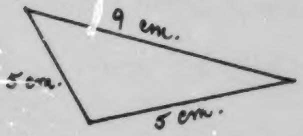
e.g.,



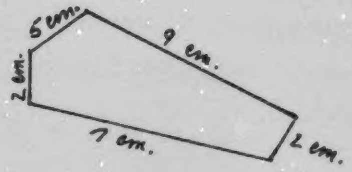
STRATEGY 2: Prepare answer cards to match perimeter of figures. Display the polygons on one side of the chalkboard. Display cards on other side of chalkboard. Have children match figure with answer card.

When this activity is complete, draw polygons on the chalkboard and direct the students to find the perimeters.

e.g.,



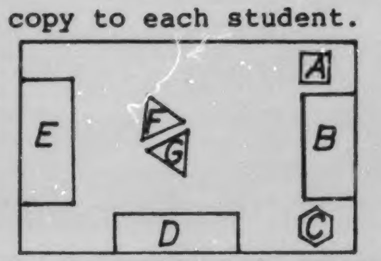
P =



P =

6.10.01.03 **solve word problems related to skills learned in this module**

STRATEGY 1: Draw this diagram on a rexograph sheet and distribute one copy to each student.



Joe Brown's Living Room

STRATEGY 1: cont'd

Joe Brown's living room measures 17 ft. by 20 ft. They want to put wood molding along the perimeter of the room. How many feet of molding will they need? Also, what is the perimeter of each piece of furniture whose measurements are as follows:

Square Table (A) - side = 2 ft. 4 in.
Couch (B) - 7 ft. by 3 ft.
Octagonal Table (C) - side = 1 ft. 1 in.
Small Sofa (D) - 5 ft. 2 in. by 2 ft. 10 in.
Bookcases (E) - 8 ft. by 2 ft.
2 Triangular Tables (F and G) each one - side = 1 ft. 5 in.

Solve this problem with the entire class. Ask, "What are you being asked to find?" (The amount of wood molding needed, and then the perimeter of each piece of furniture.)

Ask, "How would you find out how many feet of molding are needed?" (Find the perimeter of the room.)

Give students time to work together on this project.

STRATEGY 2: Write on the chalkboard:

> Freedom Park is shaped like a rectangle. It has a length of 50 feet and a width of 40 feet. What is the perimeter of Freedom Park?

Say, "To solve this problem we must find out the important information. We can cross out all the words that we do not need."

STRATEGY 2: cont'd

Ask, "In the first sentence, what words are unnecessary? Put a red line through these words." (Freedom Park is shaped like) Ask, "In the second sentence, what words are unnecessary? Put a red line through these words." (It has) Ask, "In the third sentence, what words are unnecessary? Put a red line through these words." (of Freedom Park)

Say, "Let's write the phrases left on the chalkboard." Write these phrases on the chalkboard:

- a rectangle
- a length of 50 feet and a width of 40 feet
- What is the perimeter?

Ask, "Do we have enough information to solve this problem?" (Yes.) Ask, "What is the formula for the perimeter of a rectangle?" (P = 21 + 2w)

Ask a student to solve the problem.
e.g.,

$$P = (2 \times 50) + (2 \times 40)$$
$$P = 100 + 80$$
$$P = 180 \text{ ft.}$$

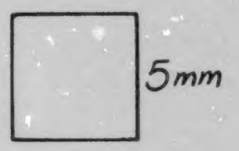
Follow this procedure with other word problems.

P.O. 6.10.01.01

NAME: ______________________ CLASS: __________ DATE: ________

Directions: Find the perimeter of the equilateral polygons.

1

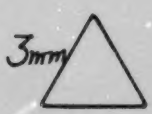


$P = 4S$

$P = 4 \times 5$

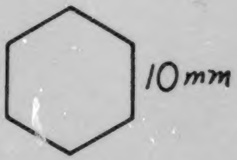
$P = 20$ mm

2



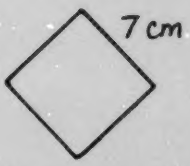
P = ______

3



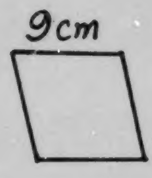
P = ______

4



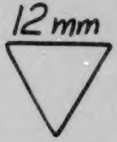
P = ______

5



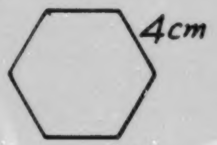
P = ______

6



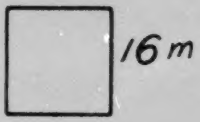
P = ______

7



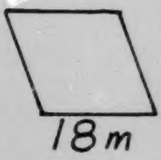
P = ______

8



P = ______

9



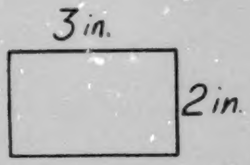
P = ______

P.O. 6.10.01.02

NAME: ____________________ CLASS: __________ DATE: ________

Directions: I) Find the perimeter.
II) Draw two rectangles whose perimeter is 12 inches.

I ①

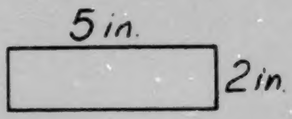


P = 2L + 2W

P = (2X3) + (2X2)

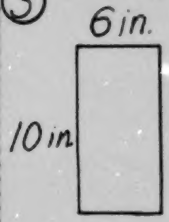
P = 6 + 4 = 10 in.

②



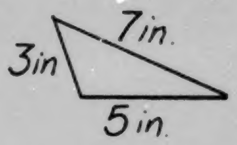
P = ______

③



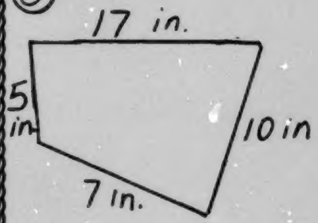
P = ______

④



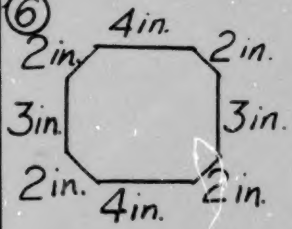
P = ______

⑤


17 in.
5 in
10 in
7 in.

P = ______

⑥


4 in.
2 in.
2 in.
3 in.
3 in.
2 in.
4 in.
2 in.

P = ______

II RECTANGLE 1

RECTANGLE 2

P.O. 6.10.01.03

NAME: ______________________ CLASS: ________ DATE: ________

Solve the problems.

1. The door to the classroom is a rectangle with a width of 24 inches and a length of 72 inches. What is its perimeter?

   Solution: ____________________

2. Bob wants to build a fence around his triangular vegetable garden. Its sides are 4 feet by 6 feet by 5 feet. What is its perimeter?

   Solution: ____________________

3. Father is going to build a frame for my diploma. The diploma is 30 cm long and 14 cm wide. What is the amount of wood needed to frame the diploma?

   Solution: ____________________

4. The classroom measure 16.5m long by 25.4 m wide. What is the perimeter of the classroom?

   Solution: ____________________

5. Mary wants to trim the border of her Christmas card with ribbon. The length of the paper is 20.2 cm and the width is 26.7 cm. How much ribbon will she need to buy?

   Solution: ____________________

6. The front lawn of the school has a strange shape. It measures 5.1m by 2.3m by 5.4m by 2.2m. What is its perimeter?

   Solution: ____________________

6.14.08 FRACTIONS
(ongoing)

PERFORMANCE OBJECTIVES

The student will be able to...

6.14.08.01 find a common denominator using multiples of each given denominator;

e.g.,

$$\frac{1}{8} \longrightarrow 8,\ 16,\ 24,\ 32,\ 40,\ 48,\ 56,\ 64$$
$$\frac{3}{16} \longrightarrow 16,\ 32,\ 48,\ 64$$

6.14.08.02 find the least common denominator;

e.g.,

LCD $\frac{1}{8}$ and $\frac{3}{16}$ is 16

6.14.08.03 use the multiplicative identity element of 1 in order to convert a given fraction to an equivalent fraction;

e.g.,

$$\frac{1}{8} \times \frac{2}{2} = \frac{2}{16}$$

Note: $\frac{2}{2} = 1$

6.14.08.04 change unlike fractions to equivalent fractions using the least common denominator.

e.g.,

Recall that 16 is the LCD.

$$\frac{1}{8} \times \frac{2}{2} = \frac{2}{16}$$
$$\frac{3}{16} \times \frac{1}{1} = \frac{3}{16}$$

6.14.08

VOCABULARY

TERMS

fraction
numerator
denominator
factor
common denominator

GETTING STARTED

Distribute a partially completed table of multiples to each student. Allow the students two minutes to fill in the spaces on the sheet. Form teams of six students each.

e.g.,

2	3	4	5	6	7	8	9	10	11	12
4	6	8	10	12	14	16	18		22	24
6	9	12	15		21		27	30	33	36
8		16		24	28	32				48
10	15			30			45			
	18	24		36	42	48	54			72
14		28			49					84
	24			48			72			96
18	27	36				72	81			
20	30	40		60	70	80	90			
22	33			66		88	99			
24		48						120		144

Now, ask one student on either team to read one column of multiples. Ask, "Who can read the multiples of 7?" If the column is read correctly, the student's team scores one point; if it is not read correctly, the other team scores a point.

The student names one member of the opposing team and assigns him/her a column from the multiple chart to be read. Each student who is called then calls a member of the opposing team until every player has had a chance to score a point.

GETTING STARTED cont'd

Say, "We are going to play the game of "BUZZ." Select the BUZZ number and determine the last number in the multiple count, e.g., "BUZZ 7" can terminate with 84 or continue to the largest multiple of 7 under 100.

Say, "We are going to count by ones, with each successive student continuing the count. If your number is a multiple of 7 you must say "BUZZ" instead of the number. The next student will continue the count with the next number."

e.g.,

Count 1, 2, 3, 4, 5, 6, BUZZ, 8, 9, 10, 11, 12, 13, BUZZ, 15...

Say, "If you call out the wrong number or forget to BUZZ, you are out of the game. The game ends when one of the last two students remaining makes an error."

Note: You may decide to terminate the game sooner or change the BUZZ number after several rounds of the original number have been completed.

6.14.08

6.14.08.01 **find a common denominator using multiples of each given denominator**

STRATEGY 1: Explain that only like objects can be added or subtracted; there is no point in adding one pen plus three books. Similarly, $\frac{1}{8}$ and $\frac{3}{16}$ do not make 4 of anything, but we can add them together if we can make their denominators match. Making the denominators match is called, "finding their common denominator."

List the multiples of both denominators and ask the students to look for the smallest multiple both fractions have in common.

To find the Common Denominator for $\frac{1}{8}$ and $\frac{3}{16}$, write

$\frac{1}{8}$ ——> 8 16 24 32 40 48 56 64 72 80

$\frac{3}{16}$ ——> 16 32 48 64 80

Ask, "What multiples do eight and sixteen have in common?" Say, "These are called common denominators. The common denominators for $\frac{1}{8}$ and $\frac{3}{16}$ are: 16, 32, 48, 64, 80..."

STRATEGY 2: Display this example written on oaktag.
e.g.,

$$\text{Add } \frac{1}{2} + \frac{3}{4} + \frac{5}{6} = \boxed{}$$

Give each student a set of index cards numbered 1, 2, 3, 5, and 7. Ask a student to place the cards for prime factors of 2 on the flannel board or the chalkboard ledge.

Ask a second student to contribute the prime factors of 4 from his/her set of cards. He/she will have only one 2 to contribute. Use this limitation to open a discussion that there is

STRATEGY 2: cont'd

already a 2 card on the chalkboard. This 2 and the one being contributed now are sufficient to make a four. Ask a third student to contribute the prime factors of six. Again, there is already a two on the chalkboard, so we need only to add a three to the set of factors. Write the set of factors on the chalkboard and verify that the given denominators are included.

$$\underbrace{2 \times \overbrace{1 \times 2}^{4}}_{2} \times \underbrace{2 \times 3}_{6}$$

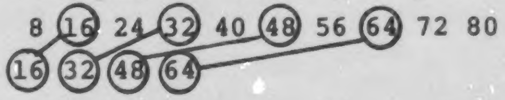
4
2 x 1 x 2 x 3, thus
2 x 6

The common denominator is 2 x 1 x 2 x 3 or 12.

6.14.08.02 **find the least common denominator**

STRATEGY 1: Ask a student to list the multiples of 8 through 80 on the chalkboard. Ask another student to list the multiples of 16 through 64, underneath the first student's list. Ask a third student to connect the common multiples of both sets by circling them.

e.g.,



Say, "These are some of the common multiples of 8 and 16, but the least common multiple of 8 and 16 is 16." The least common multiple for two numbers is the least common denominator (LCD) for fractions having these denominators. The least common denominator for $\frac{1}{8}$ and $\frac{3}{16}$ is therefore 16.

6.14.08

STRATEGY 2: cont'd

Continue with the above procedure using other denominators. Ask the students to list the multiples only until the least common multiple appears.

e.g.,

$\frac{2}{3}$ 3 6 9 12 15

$\frac{1}{4}$ 4 8 12

The least common denominator for $\frac{2}{3}$ and $\frac{1}{4}$ is 12.

STRATEGY 2:

Prepare a set of cards by cutting 80 two-inch squares of oaktag. Write the numerals 1 through 20 on four sets of cards. Shuffle the cards and put the stack face down on the desk.

When asked, each student takes two cards from the top of the deck. These represent denominators of fractions for which he/she wishes to find the least common denominator.

Ask the student to say aloud what he/she is thinking in order to determine the least common denominator. For example, a student has drawn the cards numbered 8 and 6. He/she will say, "Is 1 x 8 a multiple of 6?" (No.) "Is 2 x 8 a multiple of 6?" (No). "Is 3 x 8 a multiple of 6? (Yes.) Say, "The least common multiple of 8 and 6 is 24; therefore, the least common denominator of 8ths and 6ths is 24ths."

6.14.08.03 **use the identity element of 1 in order to convert a given fraction to an equivalent fraction**

STRATEGY 1:

Ask the students to multiply any number by 1.

e.g.,

$3 \times 1 = \boxed{\quad\quad}$

$7 \times 1 = \boxed{\quad\quad}$

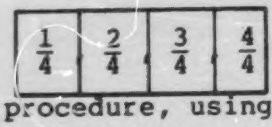
$12 \times 1 = \boxed{\quad\quad}$

$n \times 1 = \boxed{\quad\quad}$

STRATEGY 1:
cont'd

Ask, "Can you summarize what you have observed?" (When any number is multiplied by [illegible] the number is unchanged.) Demonstrate with fractional drawings how the total pieces are equivalent to one whole.

e.g.,



or 1

Repeat this procedure, using other examples.

Show the students how to use the number one in fraction form as a multiplier for other fractions to form equivalent fractions.

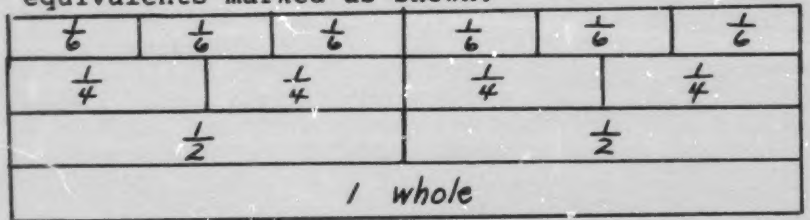
e.g., $\frac{2}{3} \times \frac{1}{1} = \frac{2}{3}$

$\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$

$\frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$ thus $\frac{2}{3} = \frac{4}{6} = \frac{6}{9}\ldots$

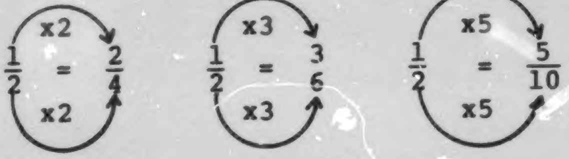
STRATEGY 2:

Distribute prepared sheets with fractional equivalents marked as shown.



Ask students to observe the $\frac{1}{2}$ mark on each fraction bar. Discuss other names for the $\frac{1}{2}$ mark on each successive bar. Say, "Into how many pieces is the second bar divided?" (Four.) "How many of those pieces are needed to make $\frac{1}{2}$ of a bar?" (Two.) "So we can say $\frac{1}{2} = \frac{2}{4}$."

Repeat this procedure for each bar, asking the students to write the information on their worksheets. Using the written facts, ask the students to equate the following relationships:



6.14.08

STRATEGY 2: cont'd

Ask, "How do we find equivalent fractions?" (Equivalent fractions can be found by multiplying the numerator and denominator of a fraction by the same number, which means we are really multiplying by one.)
e.g.,

$$1 = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{5}{5}\ldots$$

6.14.08.04 **change unlike fractions to equivalent fractions using the least common denominator**

STRATEGY 1: Review finding the least common denominator (LCD) for a pair of fractions.
e.g.,
Find the LCD for $\frac{1}{8}$ and $\frac{3}{16}$.

Ask the students if 8 is a factor of 16. Since it is, then 16 is the LCD.
e.g.,

$$\frac{1}{8} = \frac{}{16}$$
$$\frac{3}{16} = \frac{}{16}$$

Say, "Now we must find a new numerator for $\frac{1}{8}$ which will make it equal to 16ths. Observe $\frac{1}{8} = \frac{}{16}$; thus the numerator must also be multiplied by 2; since $\frac{2}{2} = 1$ and $\frac{1}{8} \times \frac{2}{2} = \frac{2}{16}$. Similarly, $\frac{3}{16} \times \frac{1}{1} = \frac{3}{16}$.
Repeat this procedure, using other examples.

STRATEGY 2: To change a pair of unlike fractions to like fractions, use the following plan:

Unlike Fractions	LCD	Like Fractions
	1 x 8, No	$\frac{5}{6} = \frac{20}{24}$
$\frac{5}{6}, \frac{3}{8}$	2 x 8, No	
	3 x 8, Yes = 24	$\frac{3}{8} = \frac{9}{24}$
$\frac{1}{4}, \frac{2}{3}$	1 x 3, No	$\frac{1}{4} = \frac{3}{12}$
	2 x 3, No	
	3 x 3, No	
	4 x 3, Yes = 12	$\frac{2}{3} = \frac{8}{12}$
$\frac{1}{2}, \frac{4}{9}$	1 x 9, No	$\frac{1}{2} = \frac{9}{18}$
	2 x 9, Yes = 18	$\frac{4}{9} = \frac{8}{18}$

P.O. 6.14.08.01

NAME: ______________________ CLASS: ________ DATE: ________

Directions: Find the LCM for L.C.M. each pair of fractions.

(1)

$\frac{2}{5} = \frac{\quad}{45}$ 5, 10, 15, 20, 25, 30, 35, 40, 45, 50...

$\frac{4}{9} = \frac{\quad}{45}$ 9, 18, 27, 36, 45, 54...

(2)

$\frac{2}{3} =$

$\frac{3}{4} =$

(3)

$\frac{7}{8} =$

$\frac{4}{5} =$

(4)

$\frac{2}{3} =$

$\frac{3}{7} =$

(5)

$\frac{5}{6} =$

$\frac{3}{5} =$

(6)

$\frac{3}{10} =$

$\frac{5}{12} =$

$\frac{3}{4} =$

P.O. 6.14.08.02

NAME: ______________________________ CLASS; ________ DATE: ________

Directions: Find the Least Common Denominator for each pair of fractions. Then put an X or an O in the tic-tac-toe box that contains that answer. Continue taking turns until someone wins or the game is tied.

Frankie Fraction

X

$\frac{1}{8}$, $\frac{5}{24}$

$\frac{2}{5}$, $\frac{3}{4}$

$\frac{1}{6}$, $\frac{1}{10}$

$\frac{1}{2}$, $\frac{1}{3}$

Denise Denominator

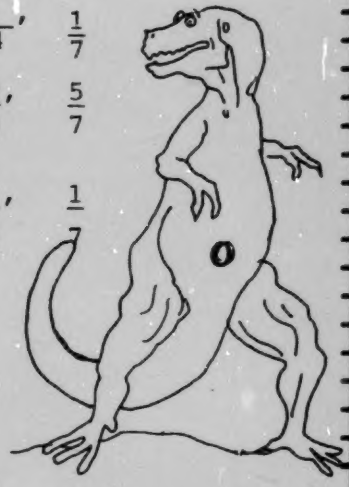
O

$\frac{1}{3}$, $\frac{2}{5}$

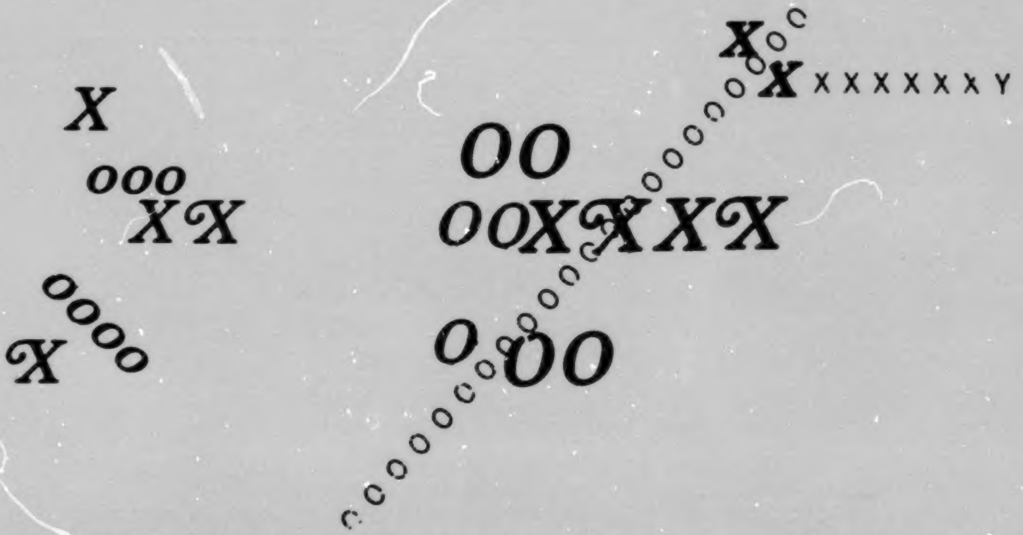
$\frac{3}{14}$, $\frac{1}{7}$

$\frac{2}{3}$, $\frac{5}{7}$

$\frac{3}{5}$, $\frac{1}{7}$



35	21	20
38	24	30
6	14	15



P.O. 6.14.08.03

NAME: ______________________ CLASS: __________ DATE: ________

Directions: Change each fraction to an equivalent fraction using the denominator given. Find the numerator of the equivalent fraction once on the Bingo card and cross that number off. Continue until you get Bingo.

1. $\frac{1}{5} = \frac{\quad}{15}$
2. $\frac{1}{3} = \frac{\quad}{15}$
3. $\frac{1}{12} = \frac{\quad}{180}$
4. $\frac{11}{12} = \frac{\quad}{180}$
5. $\frac{1}{2} = \frac{\quad}{6}$
6. $\frac{1}{3} = \frac{\quad}{6}$
7. $\frac{5}{12} = \frac{\quad}{180}$
8. $\frac{3}{4} = \frac{\quad}{20}$
9. $\frac{7}{10} = \frac{\quad}{20}$
10. $\frac{1}{6} = \frac{\quad}{30}$
11. $\frac{1}{10} = \frac{\quad}{30}$
12. $\frac{1}{18} = \frac{\quad}{72}$
13. $\frac{5}{24} = \frac{\quad}{72}$
14. $\frac{2}{5} = \frac{\quad}{15}$
15. $\frac{2}{3} = \frac{\quad}{15}$
16. $\frac{4}{5} = \frac{\quad}{15}$
17. $\frac{1}{18} = \frac{\quad}{252}$
18. $\frac{1}{28} = \frac{\quad}{252}$
19. $\frac{1}{2} = \frac{\quad}{14}$
20. $\frac{4}{7} = \frac{\quad}{14}$

15	12	3	165	20
75	18	10	9	15
15	5	FREE SPACE	8	7
24	6	5	14	4
3	14	16	3	2

P.O. 6.14.08.04

NAME: ______________________ CLASS: __________ DATE: ________

Directions: Change each fraction to an equivalent fraction using the least common denominator for each set of fractions.

Unlike Fractions	LCD	Like Fractions	Unlike Fractions	LCD	Like Fractions
$\frac{7}{12}, \frac{3}{8}$		$\frac{7}{12} =$	$\frac{1}{3}, \frac{3}{4}$		$\frac{1}{3} =$
		$\frac{3}{8} =$			$\frac{3}{4} =$
$\frac{5}{6}, \frac{2}{3}$		$\frac{5}{6} =$	$\frac{9}{10}, \frac{7}{20}$		$\frac{9}{10} =$
		$\frac{2}{3} =$			$\frac{7}{20} =$
$\frac{4}{5}, \frac{5}{6}$		$\frac{4}{5} =$	$\frac{1}{3}, \frac{1}{2}, \frac{3}{4}$		$\frac{1}{3} =$
		$\frac{5}{6} =$			$\frac{1}{2} =$
					$\frac{3}{4} =$

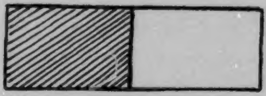
Rename each group as like fractions.

(a.) $\frac{3}{10}, \frac{7}{20}, \frac{11}{50} = \frac{\quad}{100}, \frac{\quad}{100}, \frac{\quad}{100}$

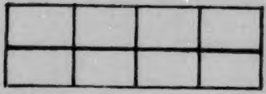
(b.) $\frac{1}{4}, \frac{7}{10}, \frac{5}{8} =$ ___, ___, ___

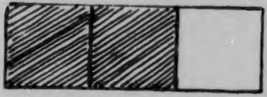
(c.) $\frac{1}{2}, \frac{3}{5}, \frac{4}{9} =$ ___, ___, ___

Shade an amount of the second diagram equivalent to the shaded amount in the first diagram.

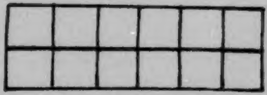


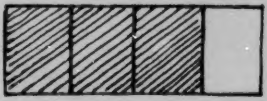
$\frac{1}{2} = \frac{\quad}{8}$



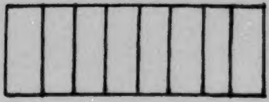


$\frac{2}{3} =$ ___





$\frac{3}{4} =$ ___



6.06.01 FACTOR PRIMES

(3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.06.01.01B rename even numbers greater than 2 as the sum of two primes;

e.g.,

even number		prime numbers
62	=	59 + 3
	=	31 + 31
	=	19 + 43

6.06.01.02A rename composite numbers as the product of primes;

e.g.,

62 = 31 x 2

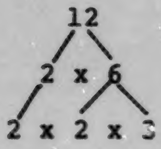
6.06.01.03A use prime factorization to find the greatest common factor.

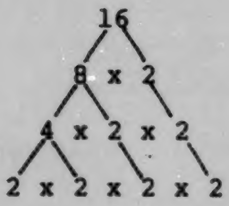
e.g.,

Step 1: Rename 12 as the product of 2 factors. 12 = 2 x 6, 12 = 3 x 4

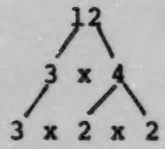
Step 2: Rename 16 as the product of 2 factors. 16 = 8 x 2, 16 = 4 x 4

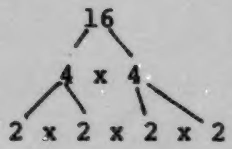
Step 3: Factor further to get prime factors.


12
2 x 6
2 x 2 x 3


16
8 x 2
4 x 2 x 2
2 x 2 x 2 x 2

or


12
3 x 4
3 x 2 x 2


16
4 x 4
2 x 2 x 2 x 2

12 expressed as a product of primes = $\cancel{2} \times \cancel{2} \times 3$

16 expressed as a product of primes = $\cancel{2} \times \cancel{2} \times 2 \times 2$

Therefore the GCF = 2 x 2 = 4.

6.06.01

VOCABULARY

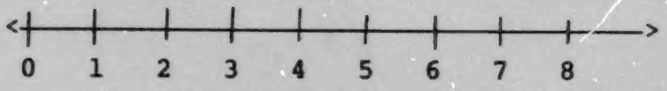
TERMS

factor
prime number
composite number

GETTING STARTED

Use a cardboard number line and a picture of a grasshopper.

e.g.,



and

Demonstrate that two is a factor of eight by explaining that:

A) "Mathhoppers" jump along a number line, starting at zero, always jumping to the right.

B) A "2 hopper" jumps two numbers at a time.

C) A "2 hopper" only lands on certain numbers. Elicit that a "2 hopper" lands on 2, 4, 6 and 8.

Explain that two is therefore a factor of each of these numbers.

Ask the students to experiment with different "mathhoppers", and to enter their results on a chart.

e.g.,

Number	Mathhoppers that land on number factors	How many mathhoppers? (How many factors?)
1	1	1
2	1, 2	2
3	1, 3	2
4	1, 2, 4	3
5	1, 5	2
6	1, 2, 3, 6	4
7	1, 7	2
8	1, 2, 4, 8	4

Say, "Some numbers are only landed on by two types of mathhopper. These numbers only have two factors." Ask, "Which mathhoppers land

GETTING STARTED cont'd

on 9?" (1 hopper which land on every number, 3 hoppers because 3 is a factor of 9, and 9 hoppers because 9 is a factor of itself land on 9.) Say, "These three numbers (1,3, and 9) are the factors of 9."

Construct a two-column list on the chalkboard. Label the columns A and B. Column A will eventually be labeled "Prime Numbers" and column B will then be labeled "Composite Numbers".
Write the first four numbers on each list.
e.g.,

A	B
2	4
3	6
5	8
7	9

Ask, "In what column do you think the number 10 belongs?" If a student answers "A", respond "No, it goes in B." If a student answers correctly,"B", say, "That is correct. Why do you think the number 10 belongs in column B?" (Ten is a composite number.) If the answer is incorrect, do not answer the question at this time.

Repeat this procedure, using each successive whole number until the students recognize that column A contains numbers which have only two factors, while column B contains numbers which have more than two factors. Ask, "Can we rename column A more precisely?" (Column A can be renamed "Prime Numbers" because prime numbers are those numbers which have exactly two factors, themselves and one.) Similarly, ask, "Can we rename column B more precisely?" (Column B can be renamed "Composite Numbers" because composite numbers are those numbers which have more than two factors.)

6.06.01

6.06.01.01 **rename even numbers greater than two as the sum of two primes**

STRATEGY 1: Prepare nine index cards using the even numbers from 4 through 20 (4,6,8,10,12,14,16,18,20), and six index cards of the first six primes (2,3,5,7,11,13) Ask a student to pick a card from the even number pile. Select another student to use the prime cards to write an addition problem on the chalkboard whose sum is the card that was picked. (Using a card twice in one problem is allowed, e.g., 5 + 5 = 10.) Repeat until all nine even number cards have been used. Ask, "Can any even number greater than two be renamed as the sum of two primes?"

Assign teams of students (3-4 students to a team) to increase the deck of index cards. (One team can make cards for all of the prime numbers from 11 through 30 and all of the even numbers from 20 through 30. Another team can prepare cards from 30 through 40. Eight teams will be enough to calculate all the numbers through 100.) Then students can take turns challenging one another (similar to the previous procedure) to find two primes whose sum is any given even number less than or equal to 100.

STRATEGY 2: Ask, "If two odd numbers are added, is the sum odd or even? If two prime numbers, (not using 2) are added, is the sum odd or even?" Elicit that the sum is always even. Ask, "Since two prime numbers (not using 2) always add to be an even number, is it possible that even numbers greater than two can be renamed as the sum of two primes? For example, can 16 be renamed as the sum of two primes?" Elicit that it is possible, because 16 = 11 + 5.

6.06.01

STRATEGY 2: cont'd

Students can work in teams (3-4 students each). One team can rename the even numbers from 4 through 20 as the sum of two primes, another can rename the evens from 20 through 30, etc. With 8 or 9 teams, the entire class can rename all the even numbers greater than 2 through 100 as the sum of two primes.

6.06.01.02 **rename composite numbers as the product of primes**

STRATEGY 1: Prepare 45 index cards using the first 15 prime numbers (there should be 3 cards for each prime).

Ask one student to pick 2 prime number cards. The other children will compute the product.

Ask, "Are all composite numbers products of prime numbers?" (Yes).

STRATEGY 2: Write these 29 numbers on the chalkboard: 2,3,5,6, 7,10,11,13,14,15,17,19,21,22,23,26,29,31,33,34, 35,37,38,39,41,43,46,47,51. Ask, "Which of these numbers are primes and which are composites?" Ask the students to determine this and then write each number under one of two columns headed, "Primes" and "Composites."

e.g.,

Primes	Composites
2	6
3	10
5	14
7	15
11	21
13	22
17	26
19	33
23	34
29	35
31	38
37	39
41	46
43	51
47	

STRATEGY 2: cont'd

Rename each number in the list of composites, as the product of two primes from the list on the left (e.g., 6 = 2 x 3, 10 = 2 x 5, 14 = 2 x 7).

Ask, "Are all composite numbers products of prime number?" (Yes).

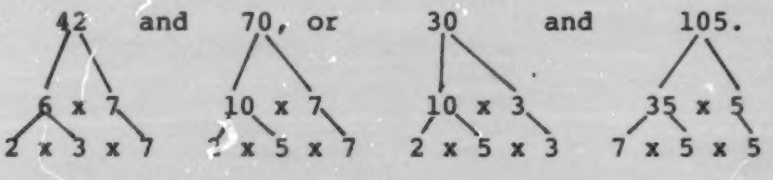
6.06.01.03 **use prime factorization to find the greatest common factor**

STRATEGY 1: Ask the students to draw factor trees to show the prime factorization of both 30 and 42.

Ask, "Which prime factors appear in both factorizations?" (2,3) Say, "2 x 3 = 6 is therefore the greatest common factor of 30 and 42. The greatest common factor of a set of numbers is the largest factor which is common to all the members of the set, and the greatest common factor (GCF) can be found by writing the prime factors of each number and then identifying all of the prime factors which are common to both numbers."

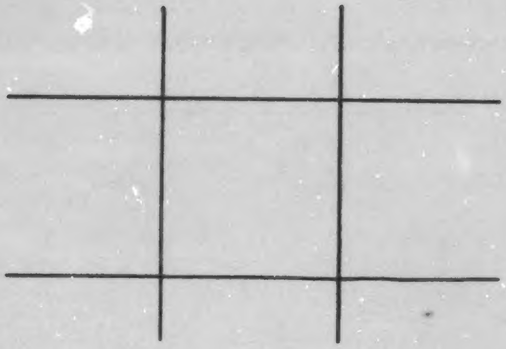
Repeat the above procedure for other composite numbers.

e.g.,



STRATEGY 2: Ask each student to draw a large tic-tac-toe grid on both sides of construction paper. On one side, ask the students to write nine composite numbers. On the other side of the paper, in the corresponding space, ask the students compute factor trees for each number.

STRATEGY 2: e.g.,
cont'd



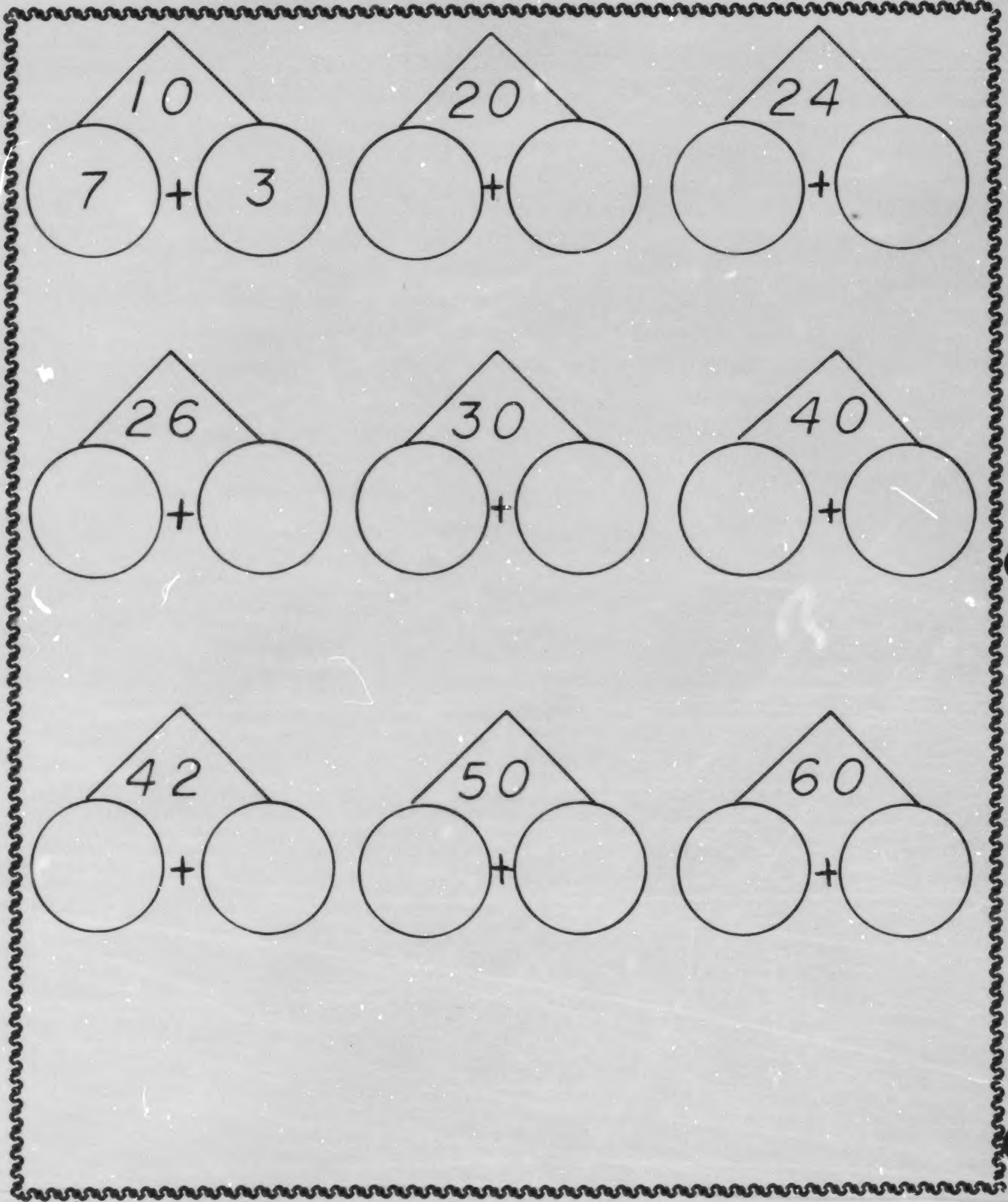
When all the students have finished, they are to form teams of two students each and switch cards. Each student will then factor the composite numbers on the other student's card. When all nine factor trees have been computed, they may be checked against the student's original work on the back of the paper. The first student to finish all nine factor trees correctly wins the game.

This procedure may be repeated. This material can be collected and reused until the skill is learned.

P.O. 6.06.01.01

NAME: ____________________ CLASS: ________ DATE: ________

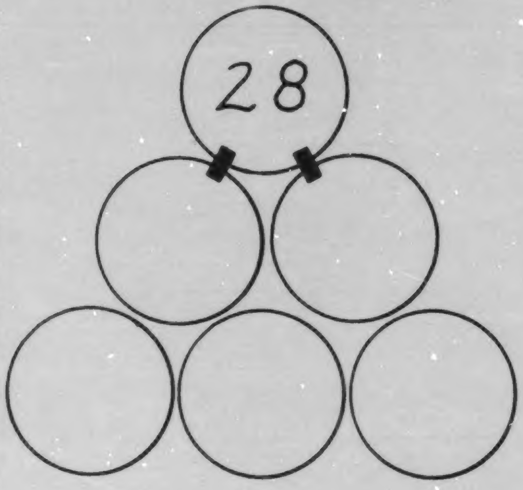
Directions: Rename the following numbers as the sum of two primes.
The first one is done for you.


10
7 + 3
20
+
24
+
26
+
30
+
40
+
42
+
50
+
60
+

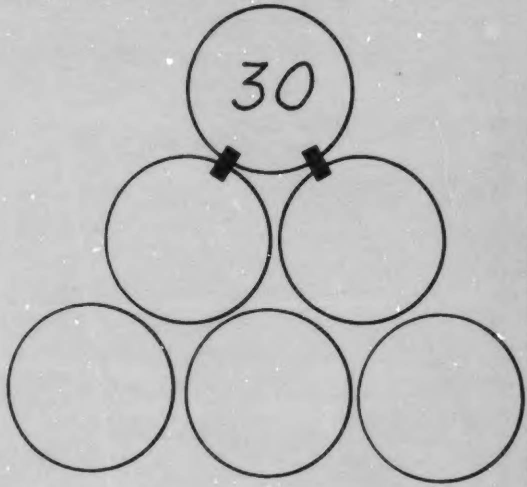
P.O. 6.06.01.02

NAME: ____________________ CLASS: ________ DATE: ________

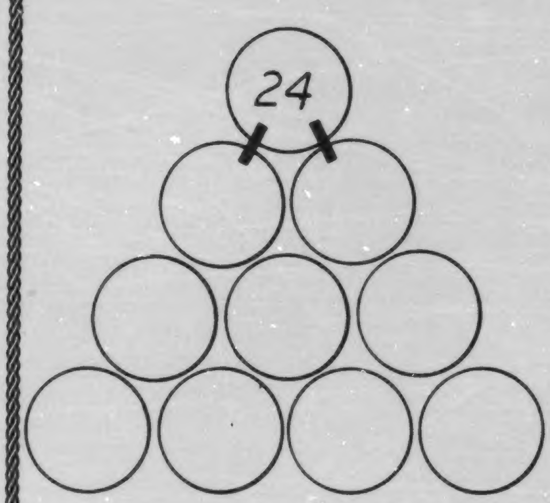
Complete the factor trees and write the prime factorizations for each number.



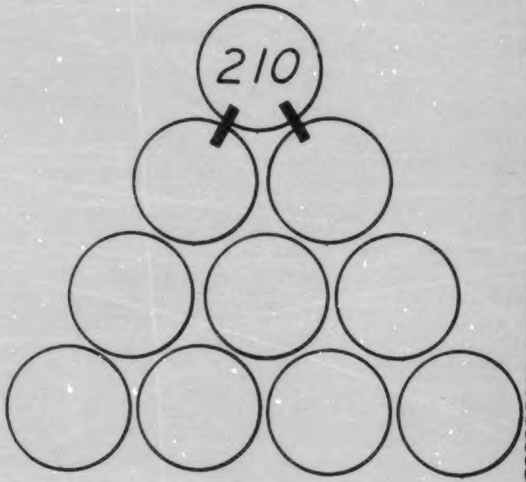
28 = ☐ x ☐ x ☐



30 = ☐ x ☐ x ☐



24 = ☐ x ☐ x ☐

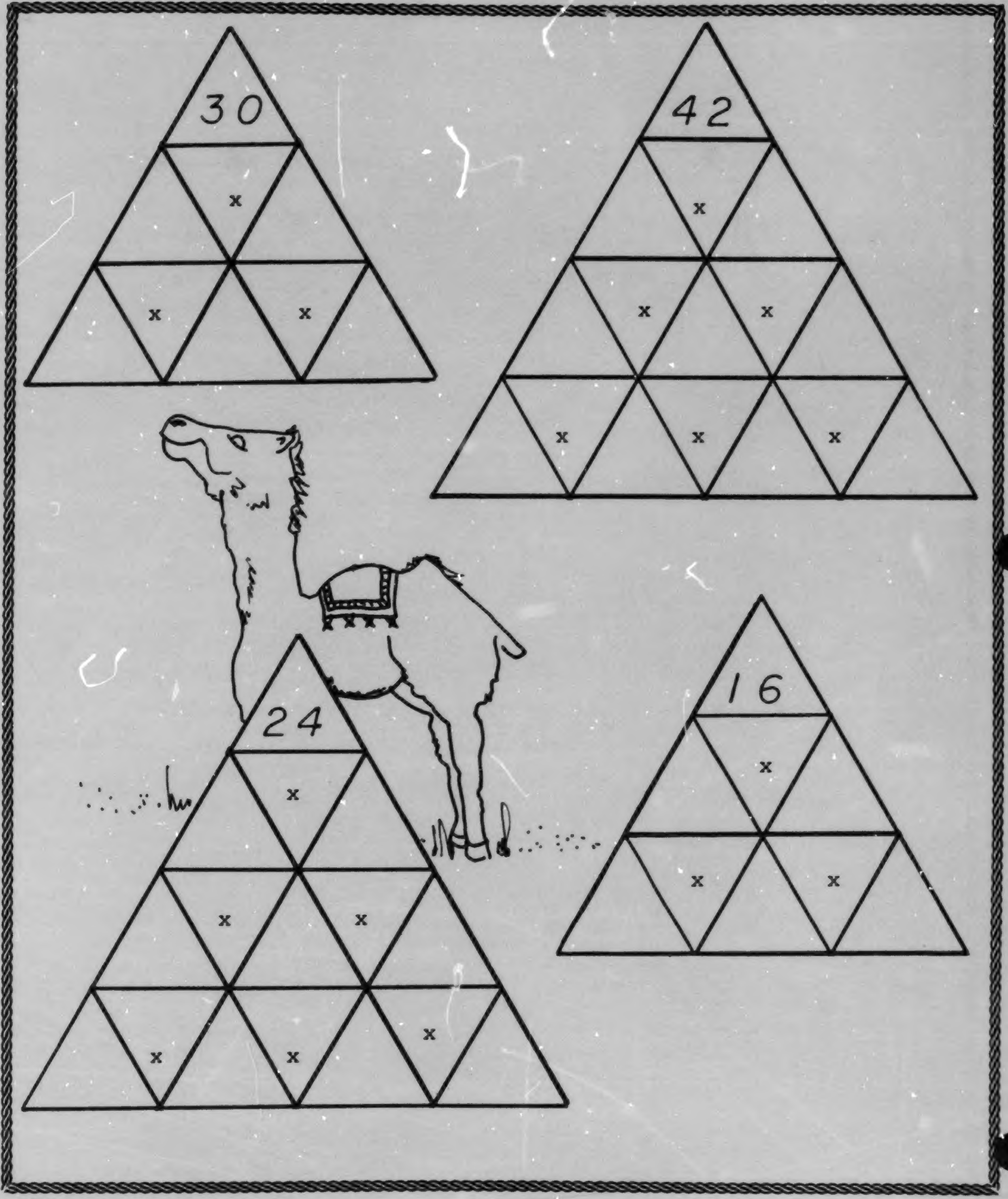


210 = ☐ x ☐ x ☐

P.O. 6.06.01.03

NAME: ______________________________ CLASS: ________ DATE: _______

Directions: Find the prime factorizations for each of the following numbers.



30
x
x
x
42
x
x
x
x
x
x
24
x
x
x
x
x
x
16
x
x
x

6.06.02 ESTIMATION WITH FRACTIONS

(3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.06.02.01A estimate the result of addition and subtraction of fractions before computation;

e.g.,

$$3\frac{1}{3} + 2\frac{2}{7} = \square$$

Estimate: $3 + 2 = 5$

$4 + 3 = 7$

The sum is greater than 5, but less than 7.

6.06.02.02A solve word problems related to skills learned in this module.

e.g., Margaret bicycled $2\frac{3}{4}$ miles to visit her friend Erica. When she got to Erica's house, they bicycled $\frac{7}{9}$ of a mile to Suzanne's house. How many miles did Margaret bicycle?

estimate	computation
$2\frac{3}{4} + \frac{7}{10} = \square$	$2\frac{3}{4} + \frac{7}{10} = \square$
$3 + 1 = 4$	$= 2\frac{15}{20} + \frac{14}{20}$
	$= 2\frac{29}{20}$
	$= 3\frac{9}{20}$ miles

Margaret bicycled $3\frac{9}{10}$ miles.

VOCABULARY

TERMS

sum
difference
least common denominator (LCD)
equivalent fraction
improper fraction
mixed number
algorithm

GETTING STARTED

Obtain several different size measuring cups, graduated containers, jars and several packages of beans for measuring. Ask students to work out the following problem:

> A mixture of paint calls for $2\frac{3}{4}$ pints of red and $3\frac{1}{2}$ pints of yellow. How many pints are needed all together?"

Ask the students to measure out the proper amounts of beans, mix them together in one graduated container, and find the total amount by reading the measurement number on the container's side.

Review the addition of fractions algorithm: If the fractions have different denominators, find the Least Common Denominator (LCD). Rename the fractions as equivalent fractions whose denominators are the LCD. Add the fractions and the whole numbers. If the sum contains an improper fraction, rename it as a mixed number, remembering to change the sum of the whole numbers accordingly. e.g.,

$$2\frac{3}{4} + 3\frac{1}{2} = 2\frac{3}{4} + 3\frac{2}{4} = 5\frac{5}{4} = 6\frac{1}{4}$$

Compare the algorithm's results to those of the actual measurement.

6.06.02

6.06.02.01 **estimate the result of addition and subtraction of fractions before computation**

STRATEGY 1: Prepare and label five pieces of construction paper measuring 5", 6", 7", $5\frac{3}{8}$" and $6\frac{3}{4}$".

Say, "For a plumbing job, a plumber needs two pieces of pipe, one $6\frac{3}{4}$" long, and the other $5\frac{3}{8}$" long. How much pipe will he need all together?"

Show the students the labeled paper and ask them to compare both the $5\frac{3}{8}$" and $6\frac{3}{4}$" pieces to the 5", 6" and 7" pieces. Ask, "What do you notice about the $5\frac{3}{8}$" piece?" (The $5\frac{3}{8}$" piece is longer than the 5" piece, but is smaller than the 6" piece.) Ask, "What do you notice about the $6\frac{3}{4}$" piece?" (The $6\frac{3}{4}$" piece is longer than the 6" piece, but smaller than the 7" piece.) Say, "Estimate how much pipe the plumber needs all together." Write the problem and the low and high estimates on the chalkboard.

e.g.,

$6\frac{3}{4} + 5\frac{3}{8} =$

Low estimate: 6 + 5 = 11 $\begin{array}{r} 6 \\ +5 \\ \hline 11 \end{array}$

High estimate: 7 + 6 = 13 $\begin{array}{r} 7 \\ +6 \\ \hline 13 \end{array}$

Say, "The sum is greater than 11 but less than 13, according to the estimate." Ask the students to compute the actual sum.

e.g.,

$$\begin{array}{rcl} 6\frac{3}{4}" & = & 6\frac{6}{8} \\ +5\frac{3}{8}" & = & 5\frac{3}{8} \\ \hline & & 11\frac{9}{8} = 12\frac{1}{8}" \end{array}$$

STRATEGY 1: cont'd

Ask, "Is the actual answer close to the estimate?" (Yes.) The students should then estimate how much longer the $6\frac{3}{4}$" pipe is than the $5\frac{3}{8}$" pipe. Ask, "What operation is used with the words longer than?" (Subtraction.) Write the problem and the estimate on the chalkboard.

e.g.,

How much longer is the $6\frac{3}{4}$" pipe than the $5\frac{3}{8}$" pipe?

Problem	Estimate
$6\frac{3}{4}$"	6
$-5\frac{3}{8}$"	−5
	1

Say, "According to our estimate, one pipe is approximately 1" longer than the other. Ask, "Is the actual answer close to the estimate? (Yes.) Say, "Please compute the actual difference."

$$\begin{array}{rcl} 6\frac{3}{4}\text{"} & = & 6\frac{6}{8} \\ -5\frac{3}{8}\text{"} & = & 5\frac{3}{8}\text{"} \\ \hline & & 1\frac{3}{8}\text{"} \end{array}$$

STRATEGY 2: Write the following multiple-choice example on the chalkboard:

$3\frac{1}{3} + 4\frac{4}{5} =$

A) $2\frac{4}{15}$ B) 7 C) $8\frac{2}{15}$ D) $9\frac{1}{3}$ E) $12\frac{4}{15}$

Ask the students to estimate the sum and decide which choices are too high or too low.

e.g.,

Low estimate: 3 + 4 = 7
High estimate: 4 + 5 = 9

Ask, "Which choices are too high?" (D, E) "Which choice is too low?" (A)

6.06.02

STRATEGY 2: cont'd

Elicit that only B and C are close enough to the estimates to be correct, and that since the correct answer must be more than 7, only C can be correct.

Ask the students to compute the actual sum.

$$\begin{array}{r} 3\frac{1}{3} = 3\frac{5}{15} \\ +4\frac{4}{5} = 4\frac{12}{15} \\ \hline 7\frac{17}{15} = 8\frac{2}{15} \end{array}$$

Ask, "Is the actual answer close to the estimate?"

Repeat this procedure for:

$$9\frac{3}{4} - 4\frac{1}{3}$$

A) $13\frac{5}{8}$ B) $5\frac{3}{2}$ C) $36\frac{4}{15}$ D) $5\frac{7}{15}$ E) 4

Ask the students to estimate the answer:

$$9 - 4 = 5$$

Elicit that only B and D are close. The students rule out B because the fractional part ($\frac{3}{2}$) is seen to be the result of an incorrect procedure ($\frac{4}{5} - \frac{1}{3} = \frac{3}{2}$, numerator minus numerator, over denominator minus denominator). Thus only D can be correct. Ask the students to compute the difference and then compare it to the estimate.

e.g.,

$$\begin{array}{r} 9\frac{3}{4} = 9\frac{9}{12} \\ -\ 4\frac{1}{3} = 4\frac{4}{12} \\ \hline 5\frac{5}{12} \end{array}$$

Ask, "Is the actual answer close to the estimate?" (Yes.)

6.06.02.02 **solve word problems related to skills learned in this module.**

STRATEGY 1: Cut several pieces of string greater than 30" in length. Ask the students to make estimates first,

STRATEGY 1: cont'd

and then cut the string to their estimates to answer the following problem.

> A breadbox is $13\frac{3}{4}$" long and
> a toaster oven is $15\frac{1}{3}$" long.
> Can they both fit side by side
> on the top of a 30" wide shelf?

Say, "Estimate the length of the breadbox." (The breadbox is between 13" and 14".) Say, "Estimate the length of the toaster oven." (The oven is between 15" and 16".)

Students should cut four lengths of string and compare them to a 30" length of string. Say, "Compare the 30" string to the 14" and 16" strings." Ask, "Will the objects fit on the shelf?" Then ask them to compute the actual combined length.

e.g.,

$$\begin{array}{rcl} 13\frac{3}{4} & = & 13\frac{9}{12} \\ +15\frac{1}{3} & = & 15\frac{4}{12} \\ \hline & & 28\frac{13}{12} = 29\frac{1}{12}" \end{array}$$

Now answer the question, "Yes, both the breadbox and the toaster oven will fit on the shelf."

STRATEGY 2: Ask the students to estimate the results of the following problem.

> About how many feet long should a shelf
> be for a $3\frac{1}{3}$-foot-long set of
> encyclopedias and a $2\frac{3}{4}$-foot-long
> set of almanacs to fit on it?

Ask the students to estimate.

e.g.,

Low estimate: 2 + 3 = 5
High estimate: 3 + 4 = 7

6.06.02

STRATEGY 2: cont'd

Say, "Estimate the length of the shelf." (The shelf should be greater than 5 ft. and less than 7 ft. long.) Ask the students to compute the sum and compare it to the estimate:

e.g.,

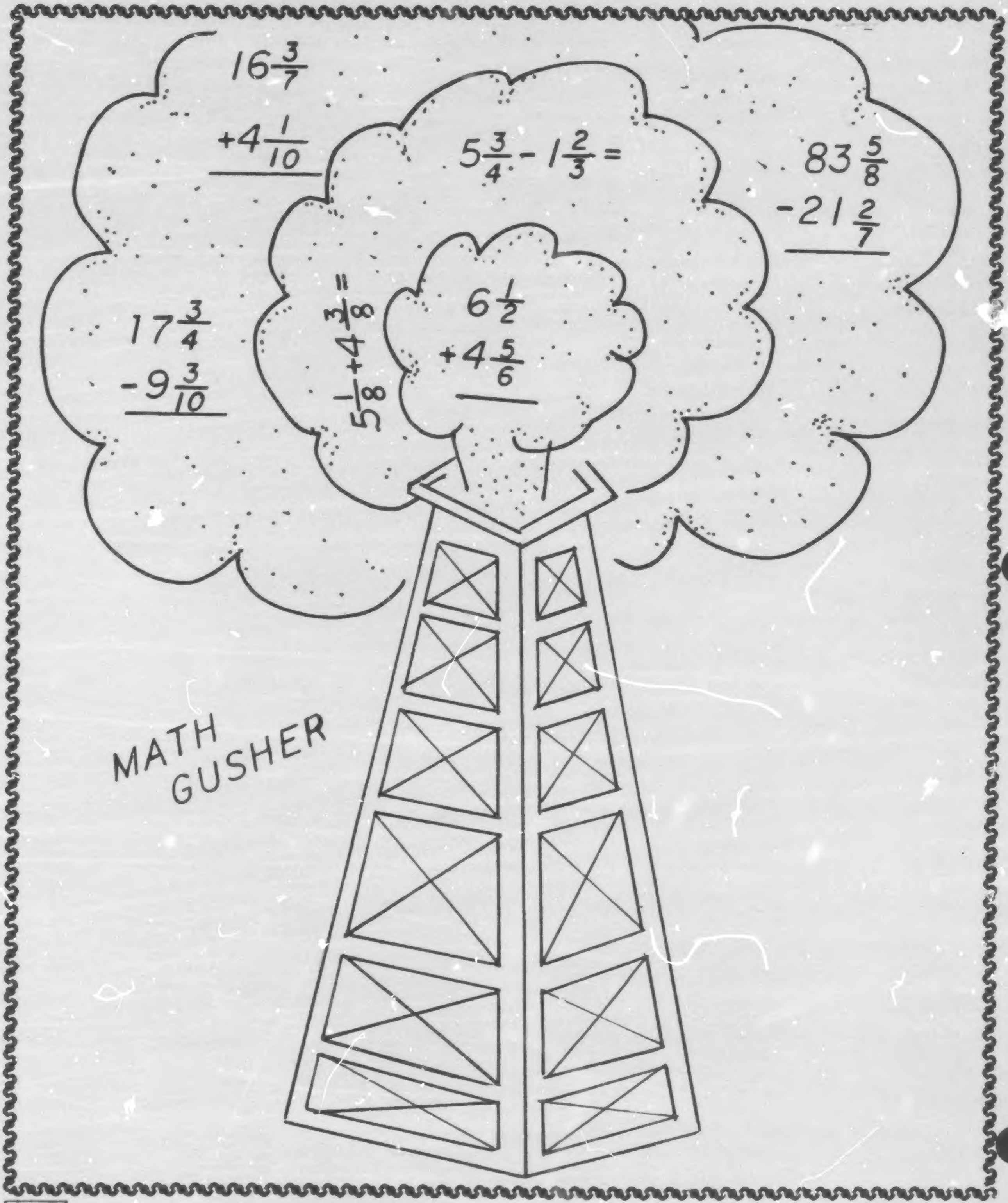
$$\begin{array}{rl} 3\,\frac{1}{3}'' = & 3\,\frac{4}{12} \\ +2\,\frac{3}{4}'' = & 2\,\frac{9}{12} \\ \hline & 5\,\frac{13}{12} = 6\,\frac{1}{12}' \end{array}$$

Ask, "Is the sum close to the estimates?" (Yes.)

P.O. 6.06.02.01

NAME: ______________________________ CLASS: __________ DATE: __________

Directions: Estimate each sum or difference; then calculate the answer.



$16\frac{3}{7} + 4\frac{1}{10}$

$5\frac{3}{4} - 1\frac{2}{3} =$

$83\frac{5}{8} - 21\frac{2}{7}$

$17\frac{3}{4} - 9\frac{3}{10}$

$5\frac{1}{8} + 4\frac{3}{8} =$

$6\frac{1}{2} + 4\frac{5}{6}$

P.O. 6.06.02.02

NAME:____CLASS:_________DATE:_______

Direction: Solve each problem by first estimating and then computing the sum or difference.

1. Sam worked at the bakery 8 1/2 hours on Monday and 12 3/4 hours Tuesday. How many hours did he work all together both days?

SAM
SAM'S
BAKERY

2. The bakery sold 6 3/4 dozen chocolate cookies one week and 9 2/3 dozen chocolate cookies the next week. How many chocolate cookies did the bakery sell during both weeks?

3. At the beginning of the week there were 5 3/4 bags of flour in the bakery. By the end of the week only 1 2/3 bags were left. How many bags were left. How many bags were used that week?

4. That same week they used 18 3/4 pounds of chocolate chips. If they started with 78 1/2 pounds of chocolate chips, how many were left?

6.06.03 SUBTRACTION OF FRACTIONS

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.06.03.01A subtract a mixed number from a whole number with simplification;

e.g.,

$$\begin{array}{rcr} 4 & = & 3\,\frac{8}{8} \\ \underline{-2\frac{1}{8}} & = & \underline{-2\,\frac{1}{8}} \\ & & 1\,\frac{7}{8} \end{array}$$

6.06.03.02A subtract fractions having unlike denominators with simplification;

e.g.,

$$\begin{array}{rcrcccr} 7\,\frac{1}{3} & = & 7\,\frac{4}{12} & = & (6\,\frac{12}{12} + \frac{4}{12}) & = & 6\,\frac{16}{12} \\ \underline{-1\,\frac{3}{4}} & = & \underline{-1\,\frac{9}{12}} & = & & & \underline{-1\,\frac{9}{12}} \\ & & & & & & 5\,\frac{7}{12} \end{array}$$

6.06.03.03B check solutions using the principle of related operations;

e.g.,

$$\underline{3\,\frac{1}{8} - 2\,\frac{3}{4} =}$$

$$\begin{array}{rcrcr} 3\,\frac{1}{8} & = & 3\,\frac{1}{8} & & 2\,\frac{9}{8} \\ -\ 2\,\frac{3}{4} & - & 2\,\frac{6}{8} & = & 2\,\frac{6}{8} \\ \hline & & & = & \frac{3}{8} \end{array}$$

check

$$\begin{array}{r} \frac{3}{8} \\ +\ 2\frac{6}{8} \\ \hline 2\frac{9}{8} = 3\frac{1}{8} \end{array}$$

6.06.03.04A solve word problems related to skills learned in this module.

e.g.,

Rebecca's dress pattern calls for $2\frac{3}{4}$ yards of material. Her mother bought 5 yards of material.

How many yards will be left after Rebecca makes her dress?

$$\begin{array}{rcl} 5 & = & 4\frac{4}{4} \\ -2\frac{3}{4} & = & -2\frac{3}{4} \\ \hline & & 2\frac{1}{4} \text{ yds.} \end{array}$$

check

$$\begin{array}{r} 2\frac{3}{4} \\ +2\frac{1}{4} \\ \hline 4\frac{4}{4} = 5 \end{array}$$

Rebecca will have $2\frac{1}{4}$ yards of material left.

VOCABULARY

TERMS

least common denominator
proper fraction
improper fraction
difference
mixed numbers

GETTING STARTED

Ask, "Which is worth more, 6 dollar bills and 1 half-dollar, or 5 dollar bills and 3 half-dollars?" (They are equal in value.) Write $6\frac{1}{2} = 5\frac{3}{2}$ on the chalkboard. Explain that one of the 6 dollar bills may be exchanged for two half-dollar coins.
Write $6\frac{1}{2} = 5 + 1 + \frac{1}{2} = 5 + \frac{2}{2} + \frac{1}{2} = 5\frac{3}{2}$ on the chalkboard.

Divide the class into two teams. On ten index cards, ask the students to write these ten mixed numbers:
$4\frac{1}{5}$, $6\frac{1}{2}$, $5\frac{5}{6}$, $6\frac{3}{4}$, 5, $3\frac{6}{5}$, $5\frac{3}{2}$, $4\frac{11}{6}$, $5\frac{7}{4}$, $4\frac{3}{3}$.
Place the cards face down and play "Concentration."

A member of one team turns over two cards to determine if they have the same value. If the numerals have the same value, the team gets one point and gets another turn. If the numerals do not have the same value, both cards are again turned face down, and the other team gets a turn. The team getting the most points wins the game.

Prepare five flash cards having these mixed numbers:
$5\frac{5}{6}$, $4\frac{2}{3}$, $2\frac{1}{2}$, $1\frac{1}{4}$. Place them on the chalkboard ledge. Separate the class into two teams. A member of one team turns over two cards and must find the difference between them. If the answer is correct, the team gets one point. If the answer is incorrect, the other team gets one point. Then it is the other team's turn. The game continues until each player gets a turn. The team with the most points wins.

GETTING STARTED cont'd

Ask the class to prepare and solve the example as shown below.

e.g.,

ORIGINAL EXAMPLE

$$\begin{array}{r} 5\frac{2}{3} \\ -2\frac{1}{2} \\ \hline \end{array} \qquad \begin{array}{l} \frac{2}{3} = \frac{2}{3} \times \frac{2}{2} = \frac{4}{6} \\ \frac{1}{2} = \frac{1}{2} \times \frac{3}{3} = \frac{3}{6} \end{array}$$

REWRITTEN

$$\begin{array}{r} 5\ \frac{4}{6} \\ -2\ \frac{3}{6} \\ \hline 3\ \frac{1}{6} \end{array}$$

Elicit that the difference is $3\ \frac{1}{6}$.

Explain that when subtracting mixed numbers, first subtract the fractions, then subtract the whole numbers.

6.06.03

6.06.03.01 **subtract a mixed number from a whole number with simplification**

STRATEGY 1: Write $\begin{array}{r} 11 \\ -\ 3\frac{1}{3} \\ \hline \end{array}$ on the chalkboard. Ask, "How do we begin this example?" When we attempt to apply the procedure for subtracting mixed numbers (subtract the fractions first, then subtract the whole numbers) it is not possible to subtract the fractions because $\frac{1}{3}$ cannot be subtracted from zero. Say, "In order to perform the subtraction, the whole number 11 must be renamed so that it has a fractional part greater than $\frac{1}{3}$. Ask, "How can we rename 11?" 11 can be rewritten as 10 $\frac{3}{3}$. Ask the class to prepare and solve the example in the form used below:

$$\begin{array}{rcccr} \underline{\text{Original Example}} & & & & \underline{\text{Rewritten}} \\ 11 & = & 10 + 1 = 10 + \frac{3}{3} & = & 10\frac{3}{3} \\ \underline{-\ 3\frac{1}{3}} & = & 3\frac{1}{3} & = & \underline{-\ 3\frac{1}{3}} \\ & & & & 7\frac{2}{3} \end{array}$$

The difference is 7 $\frac{2}{3}$.

STRATEGY 2: Prepare a set of cards with the whole numbers 12, 11, 10, 9, 8 written on them. Prepare another set with the mixed numbers 6 $\frac{1}{7}$, 5 $\frac{2}{3}$, 4 $\frac{2}{5}$, 3 $\frac{1}{4}$, and 2 $\frac{5}{8}$ written on them. Place the cards on the chalkboard ledge.

Divide the class into two teams. A member of one team picks a whole number card and a mixed number card for a member of the other team, who then must find the difference. If the answer is correct, the team gets one point; otherwise, the other team gets one point. The player who performed the subtraction then picks two cards (a whole number and a mixed number card) for the next player of the opposite team. The first team with 10 points wins.

STRATEGY 2 cont'd (Alternately, the game continues until everyone in the class gets a turn, and the team with the most points wins.)

6.06.03.02 **subtract fractions having unlike denominators with simplification**

STRATEGY 1: Write $\begin{array}{r} 4\ \frac{1}{12} \\ -\ 2\ \frac{1}{2} \\ \hline \end{array}$ on the chalkboard.

Ask the class to prepare and solve the problem as shown below:

e.g.,

Original Example	LCD = 12	Rewritten
$4\ \frac{1}{12}$	$\frac{1}{12} = \frac{1}{12} \times \frac{1}{1} = \frac{1}{12}$	$4\ \frac{1}{12}$
$-\ 2\ \frac{1}{2}$	$\frac{1}{2} = \frac{1}{2} \times \frac{6}{6} = \frac{6}{12}$	$-\ 2\ \frac{6}{12}$

Ask, "How do we subtract mixed numbers?" Elicit from the class that when they attempt to apply the procedure for subtracting mixed numbers (subtract the fractions, then subtract the whole numbers) it is not possible to subtract the fractions because $\frac{6}{12}$ cannot be subtracted from $\frac{1}{12}$.

Explain to the class that, in order to perform the subtraction, the mixed number $4\ \frac{1}{12}$ should be renamed so that its fractional part is greater than $\frac{6}{12}$. Elicit that $4\ \frac{1}{12}$ can be renamed as $3\ \frac{13}{12}$. In the table above, rename $4\ \frac{1}{12}$ as $3\ \frac{13}{12}$ as follows:

e.g.,

$$\begin{array}{r} 3\ \ \frac{1}{12} + \frac{12}{12} \\ -\ 2\ \ \frac{6}{12} \\ \hline \end{array} \quad = \quad \begin{array}{r} 3\ \frac{13}{12} \\ -\ 2\ \frac{6}{12} \\ \hline \end{array}$$

STRATEGY 1: cont'd

The table now looks like this:

e.g.,

Original Example	LCD = 12	Rewritten	
$4\frac{1}{12}$	$\frac{1}{12} = \frac{1}{12} \times \frac{1}{1} = \frac{1}{12}$	$3\frac{1}{12} + \frac{12}{12} = 3\frac{13}{12}$	
$-\ 2\frac{1}{2}$	$\frac{1}{2} = \frac{1}{2} \times \frac{6}{6} = \frac{6}{12}$	$-\ 2\frac{6}{12}$	$-\ 2\frac{6}{12}$

Ask the class to compute that the difference is $1\frac{7}{12}$.

STRATEGY 2: Prepare each of these mixed numbers on a large index card: $8\frac{2}{5}$, $6\frac{1}{2}$, $4\frac{3}{5}$, $2\frac{3}{4}$, $1\frac{9}{10}$. Place the cards on the ledge of the chalkboard.

Divide the class into two teams. A member of one team picks two cards for a member of the other team, who then must find the difference. If the answer is correct, the team gets one point, otherwise the other team gets the point. The player who performed the subtraction picks two cards for the next player of the other team. The first team to get 10 points wins.

As a variation, each player in the class gets a turn. The team with the most points wins.

6.06.03.03 **check solutions using the principle of related operations**

STRATEGY 1: Write the problems $\begin{array}{r} 7 \\ -\ 2 \\ \hline 5 \end{array}$ $\begin{array}{r} 2 \\ +\ 5 \\ \hline 7 \end{array}$ on the chalkboard.

(The addition example may be used to check the subtraction example.) Explain to the class that they will do the subtraction problem, $7\frac{9}{16} - 4\frac{3}{4}$, and then will check their answer by doing an addition problem. Ask the class to do the problem in the form used previously:

e.g.,

Original Example	LCD = 16	Rewritten	
$7\frac{9}{16}$	$\frac{9}{16} = \frac{9}{16} \times \frac{1}{1} = \frac{9}{16} =$	$6\frac{9}{16} + \frac{16}{16} = 6\frac{25}{16}$	
$-\ 4\frac{3}{4}$	$\frac{3}{4} = \frac{3}{4} \times \frac{4}{4} = \frac{12}{16} =$	$-\ 4\frac{12}{16}$	$-\ 4\frac{12}{16}$

The difference is $2\frac{13}{16}$.

STRATEGY 1: cont'd

Then ask the students to check their answer by adding. The addition problem that needs to be done is $4\frac{3}{4} + 2\frac{13}{16}$. The answer that is hoped for is $7\frac{9}{16}$. Instruct the students to do their work as shown below.

e.g.,

Original Example		LCD = 16	Rewritten
$4\frac{3}{4}$	=	$\frac{3}{4} = \frac{3}{4} \times \frac{4}{4} = \frac{12}{16}$	$4\frac{12}{16}$
$2\frac{13}{16}$	=	$\frac{13}{16} = \frac{13}{16} \times \frac{1}{1} = \frac{13}{16}$	$+\ 2\frac{13}{16}$
			$6\frac{25}{16} = 7\frac{9}{16}$

Ask, "Why do we check our answer using addition?" (The check has shown that the subtraction problem was correctly solved.)

STRATEGY 2: Prepare a set of flashcards with the subtraction problems and answers as shown:

e.g.,

$$\begin{array}{r} 7\frac{5}{8} \\ -\ 4\frac{3}{4} \\ \hline 2\frac{7}{8} \end{array} \qquad \begin{array}{r} 7\frac{1}{8} \\ -\ 4\frac{3}{4} \\ \hline 2\frac{3}{8} \end{array} \qquad \begin{array}{r} 7\frac{1}{2} \\ -\ 4\frac{3}{4} \\ \hline 2\frac{3}{4} \end{array} \qquad \begin{array}{r} 7\frac{2}{5} \\ -\ 4\frac{3}{4} \\ \hline 2\frac{13}{20} \end{array} \qquad \begin{array}{r} 7\frac{3}{8} \\ -\ 4\frac{3}{4} \\ \hline 2\frac{5}{8} \end{array}$$

Prepare another set having the addition problems:

$$\begin{array}{r} 4\frac{3}{4} \\ +\ 2\frac{7}{8} \\ \hline 7\frac{5}{8} \end{array} \qquad \begin{array}{r} 4\frac{3}{4} \\ +\ 2\frac{3}{8} \\ \hline 7\frac{1}{8} \end{array} \qquad \begin{array}{r} 4\frac{3}{4} \\ +\ 2\frac{3}{4} \\ \hline 7\frac{1}{2} \end{array} \qquad \begin{array}{r} 4\frac{3}{4} \\ +\ 2\frac{13}{20} \\ \hline 7\frac{2}{5} \end{array} \qquad \begin{array}{r} 4\frac{3}{4} \\ +\ 2\frac{5}{8} \\ \hline 7\frac{3}{8} \end{array}$$

Note: The sums on the addition cards are for teacher reference only.

Divide the class into two teams and play a game of "Concentration." Turn all the cards face down. Call a member of one team to turn over two cards. If one card contains the addition problem that is the check of the other card's subtraction problem, the cards are removed, the team gets one point and gets another turn.

6.06.03.04 **solve word problems related to skills learned in this module**

STRATEGY 1: Prepare foot long strips of ribbon, string, or construction paper. Divide the class into groups of four or five students each. Write several problems similar to the ones below on index cards:

Problem

Janet had 11 $\frac{1}{2}$ inches of ribbon. She gave 6 $\frac{3}{4}$ inches of it to a friend. How many inches of ribbon did she have left? (4 $\frac{3}{4}$ inches.)

Problem

James had 10 inches of ribbon. He gave 8 $\frac{3}{4}$ inches of it to a friend. How many inches of ribbon did he have left? (1 $\frac{1}{4}$ inches.)

Distribute one card to each group, along with a scissors and a ruler.

Instruct the groups to solve their problem by measuring and cutting their ribbon, string or paper. Then ask them to work out the problem using paper and pencil. Direct them to check their answer.

When the teams finish, they should exchange cards to do another problem.

STRATEGY 2: Present this word problem to the class.

Janet made 60 ounces of pink lemonade. She used 32 $\frac{1}{4}$ ounces on a picnic. How much lemonade did she have left?"

STRATEGY 2: cont'd

Elicit that the students must find the difference between 60 ounces and 32 $\frac{1}{4}$ ounces of pink lemonade. Say, "Prepare and solve the subtraction problem in the form used previously and check."

Original Example — Rewritten

$$\begin{array}{r} 60 \\ -\ 32\frac{1}{4} \\ \hline \end{array} \; \begin{array}{c} = 59 + 1 = 59 + \frac{4}{4} \\ = \end{array} \; \begin{array}{r} 59\frac{4}{4} \\ -\ 32\frac{1}{4} \\ \hline \end{array}$$

Ask, "What is the answer to this problem?" (The difference is 27 $\frac{3}{4}$. Ask the students to check by addition. A student should state that Janet will have 27 $\frac{3}{4}$ ounces of pink lemonade left.

P.O. 6.06.03.0 1

NAME: ______________________ CLASS: __________ DATE: ________

Find each missing number below. Write the letter of that problem in the blank space above its answer on the bottom of the page. The message will spell out the answer to the question "Where did all the gophers go when Manhattan became filled with skyscrapers?"

A. $7 = 6\frac{\square}{5}$

B. $5 = 4\frac{\square}{3}$

D. $18 = 17\frac{\square}{10}$

E. $21 = 20\frac{\square}{8}$

H. $\begin{array}{r} 10 \\ -\ 4\frac{2}{3} \\ \hline \end{array}$

M. $\begin{array}{r} 12 \\ -\ 9\frac{1}{4} \\ \hline \end{array}$

N. $\begin{array}{r} 50 \\ -18\frac{5}{6} \\ \hline \end{array}$

O. $\begin{array}{r} 100 \\ -\ 18\frac{2}{3} \\ \hline \end{array}$

R. $\begin{array}{r} 10 \\ -\ 5\frac{1}{2} \\ \hline \end{array}$

T. $\begin{array}{r} 3 \\ -\ 1\frac{3}{4} \\ \hline \end{array}$

U. $\begin{array}{r} 11 \\ -\ 2\frac{2}{3} \\ \hline \end{array}$

V. $\begin{array}{r} 5 \\ -\ 3\frac{1}{4} \\ \hline \end{array}$

W. $\begin{array}{r} 95 \\ -\ 4\frac{1}{3} \\ \hline \end{array}$

THEY ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

$2\frac{3}{4}$ $81\frac{1}{3}$ $1\frac{3}{4}$ 8 10 $1\frac{1}{4}$ $81\frac{1}{3}$ 5 $31\frac{1}{6}$ $81\frac{1}{3}$ $1\frac{1}{4}$ $5\frac{1}{3}$ 8 $4\frac{1}{2}$

___ ___ ___ ___ ___ ___

3 $8\frac{1}{3}$ $4\frac{1}{2}$ $4\frac{1}{2}$ $81\frac{1}{3}$ $90\frac{2}{3}$

P.O. 6.06.03.92

NAME: ______________________ CLASS: __________ DATE: ________

I. Complete each of the following

1. $3\frac{1}{5} = 2\frac{\square}{5}$

2. $7 = 6\frac{\square}{3}$

3. $8\frac{5}{6} = 7\frac{\square}{6}$

4. $7\frac{3}{4} = 6\frac{\square}{4}$

5. $3\frac{1}{4} = 2\frac{\square}{4}$

6. $12\frac{7}{8} = 11\frac{\square}{8}$

II Where does a millionaire always sign his checks? To see the answer, subtract, find the answer below and write the letter of the problem above the space.

A) $22\frac{1}{2}$
$-\ 8\frac{3}{4}$

B) $5\frac{1}{4}$
$2\frac{2}{5}$

E) $6\frac{1}{3}$
$-\ 2\frac{5}{6}$

H) $5\frac{3}{8}$
$-2\frac{5}{6}$

M) $4\frac{1}{5}$
$-\ 3\frac{5}{6}$

O) $7\frac{5}{6}$
$-\ 6\frac{7}{8}$

T) $7\frac{1}{2}$
$-\ 4\frac{3}{4}$

Bank of Dollars & Sense 9/30/84

Pay $1,000,000

Amount 1 Million

J.M. Richman
Signature

$\overline{13\frac{3}{4}}$ $\overline{2\frac{3}{4}}$ $\overline{2\frac{3}{4}}$ $\overline{2\frac{13}{24}}$ $\overline{3\frac{1}{2}}$ $\overline{2\frac{17}{20}}$ $\overline{\frac{23}{24}}$ $\overline{2\frac{3}{4}}$ $\overline{2\frac{3}{4}}$ $\overline{\frac{23}{24}}$ $\overline{\frac{11}{30}}$

P.O. 6.06.03.03

NAME: ______________________ CLASS: ________ DATE: ________

1. Solve and check.

1. $3\frac{11}{24} - 1\frac{1}{2}$

2. $4\frac{1}{2} - 3\frac{2}{3}$

3. $14\frac{13}{12} - 3\frac{5}{8}$

4. $7\frac{1}{8} - 2\frac{1}{3}$

11. The sum of the 3 numbers in each horizontal, vertical, or diagonal row is the same. Find the missing numbers. (Hint: The sum of the numbers along the diagonal is $4\frac{2}{3} + 3\frac{1}{2} + 2\frac{1}{3} = 10\frac{1}{2}$.)

$4\frac{2}{3}$		
$3\frac{11}{24}$	$3\frac{1}{2}$	
		$2\frac{1}{3}$

P.O. 6.06.03.04

NAME:____ CLASS:__________ DATE:________

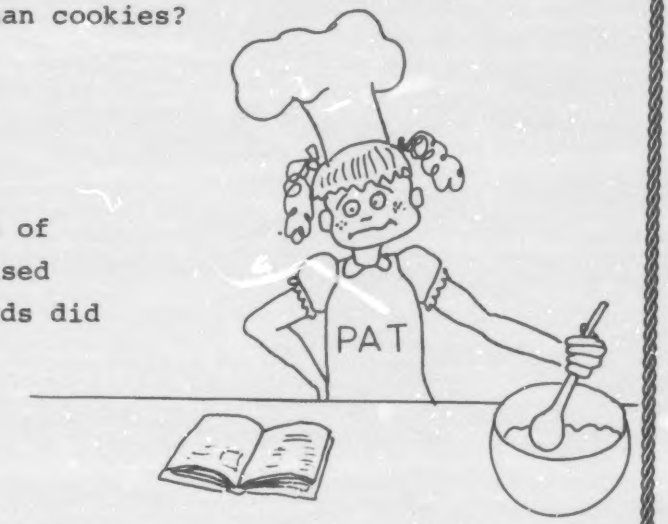
Directions: Solve and check.

(1) Pat baked a special birthday cake for a customer. She used $2\frac{1}{2}$ cups of sugar. She started with $4\frac{1}{12}$ cups of sugar. How much sugar was left?

(2) Pat baked $2\frac{3}{4}$ dozen chocolate cookies and $5\frac{1}{3}$ dozen peanut butter cookies. How many more dozen peanut butter cookies did she bake than chocolate cookies?

(3) Pat baked for $3\frac{1}{2}$ hours on Monday. She baked cookies for $1\frac{3}{4}$ of those $3\frac{1}{2}$ hours. How many hours was she baking something other than cookies?

(4) The bakery had $12\frac{2}{3}$ pounds of rainbow sprinkles. The used $4\frac{3}{4}$ pounds. How many pounds did they have left?



6.10.02 OPERATIONS WITH MEASURES

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.10.02.01A convert hours and minutes to minutes;

e.g.,

4 hours and 15 minutes =

(60 min. x 4) + 15 minutes = 255 minutes

6.10.02.02A multiply units of weight by a 1-digit multiplier and convert products to simplest form;

```
e.g.,  1 pound 14 ounces
               x6
       ----------------
       6 pounds 84 ounces =
       5 pounds  4 ounces
      -------------------
      11 pounds  4 ounces
```

6.10.02.03A multiply units of liquid measure by a 1-digit multiplier and convert products to simplest form;

```
e.g.,  1 gallon 3 quarts 1 pint
                   x4
       -------------------------
       4 gallons 12 quarts 4 pints =
       4 gallons 14 quarts 0 pints =
       7 gallons  2 quarts 0 pints =
```

6.10.02.04A multiply units of linear measure by a 1-digit multiplier and convert products to simplest form.

e.g., 2 yards 3 feet 6 inches
x7

14 yards 21 feet 42 inches =
14 yards 24 feet 6 inches =
22 yards 0 feet 6 inches

6.10.02

VOCABULARY

TERMS

minutes
hours
months
years
ounces
pounds

TERMS

pints
quarts
gallons
inches
feet
yards

GETTING STARTED

Provide demonstration model equipment to teach the equivalencies needed in this module. Show ounce weights, pound weights and a balance. Ask, "How many ounces are there in a pound?" (16 ounces = 1 pound.)

Show pint, quart and gallon containers. Ask, "How many pints make a quart? (2 pints = 1 quart.) How many quarts make a gallon?" (4 quarts = 1 gallon.)

Show a yardstick and a foot ruler. Ask, "How many inches are there in a foot? (12 inches = 1 foot.) How many feet make a yard? (3 feet = 1 yard.) How many inches in a yard?" (36 inches = 1 yard.)

Cut 6" x 2$\frac{1}{2}$" rectangular strips of oaktag. Write the following measurements on each card.
e.g.,

60 seconds
60 minutes
24 hours
7 days
4 weeks
1 pound
2 pints
4 quarts
12 inches

3 feet
1 yard
1 minute
1 hour
1 day
1 week
1 month
1 year
16 ounces

1 quart
1 gallon
1 foot
1 yard
36 inches

GETTING STARTED cont'd

Place double-sided or magnetic tape on the back of each card. Tape the cards to the chalkboard. Ask students to match the cards. e.g.,

60 seconds = 1 minute

As a variation, you might use these cards to play the game, "Concentration."

6.10.02

6.10.02.01 **convert hours and minutes to minutes**

STRATEGY 1: Write the following Airline Timetable on the chalkboard:

Flight Times From New York City

Atlantic City - 1 hour and 7 minutes
Philadelphia - 1 hour and 49 minutes
Miami - 2 hours and 57 minutes
Chicago - 3 hours and 10 minutes
Los Angeles - 5 hours and 32 minutes

Ask the students, "How would we convert the flight time from New York City to Atlantic City into minutes?" (To convert hours to minutes, we must multiply the number of hours by 60 because there are 60 minutes in an hour. We then add the remaining minutes to our answer.) Write the mathematical sentence for the conversion of New York City to Atlantic City to minutes on the chalkboard:

$$\begin{aligned} 1 \text{ hr. and } 7 \text{ min.} &= (1 \times 60) + 7 = \\ &= 60 + 7 = 67 \text{ minutes} \end{aligned}$$

Repeat this procedure for the other conversions.

STRATEGY 2: Show the class an alarm clock and say, "I want you to watch very closely while I move the hands of the clock. When the hands stop moving, I want you to write down the elapsed time." Move the hands of the clock for an elapsed time of 2 hours and 35 minutes. Ask, "How much time has elapsed? How can we convert 2 hours and 35 minutes to minutes?" (To convert hours to minutes, we must multiply the number of hours by 60 because there are 60 minutes in an hour. We then add the remaining minutes to our answer.)

Write the mathematical sentence for the conversion

STRATEGY 2: cont'd

of 2 hours and 35 minutes to minutes on the chalkboard.

e.g.,

2 hr. and 35 min. = (2x60) + 35 =
120 + 35 = 155 min.

Using the clock, repeat the initial procedure of measuring the elapsed time and then converting the hours and minutes to minutes. You may then give the students examples to work out at their desks.

6.10.02.02 **multiply units of weight by a 1-digit multiplier and convert products to simplest form**

STRATEGY 1: Write the following verbal problem on the chalkboard:

> James has seven textbooks. Each textbook weighs 3 pounds 6 ounces. How heavy are all seven textbooks together?

Ask the students, "What operation can we use to solve this problem?" (Multiplication.) Write the example on the chalkboard.

e.g.,

```
 3 lbs.  6 ounces
x        7
```

Ask, "How can we multiply mixed units?" (To multiply mixed units: first multiply each unit alone, working from right to left; whenever possible we convert the smaller units to larger units.)

e.g.,

```
  3 lbs. 6 ounces
 x       7
 21 lbs. 42 ounces
```

STRATEGY 1: cont'd

Ask, "Can we leave an answer like this?" (No, because 42 ounces equals 2 pounds 10 ounces.)

"How many ounces are there in a pound?" (16 ounces = 1 pound; therefore 32 ounces = 2 pounds.)

21 lbs.	42 ounces
2 lbs.	10 ounces
23 lbs.	10 ounces

Emphasize, "We should always convert from right to left, starting with the smallest unit."

Repeat the above procedure, with examples of varying difficulty.

STRATEGY 2:

Obtain a kitchen scale that has at least a five-pound capacity. Measure out equal amounts of grain (or any other suitable substance) in transparent storage bags.

Begin with two bags, each weighing 2 pounds 9 ounces. Ask a student to weigh the two bags on the kitchen scale. Record the amount on the chalkboard. Ask the students, "How can we check the answer without physically touching and holding the bags?" (We may multiply 2 x 2 pounds 9 ounces. To multiply mixed units, we multiply each unit alone, working from right to left. Whenever possible we convert the smaller units to larger units.)

e.g.,

2 pounds	9 ounces
x	2
4 pounds	18 ounces
1 pound	2 ounces
5 pounds	2 ounces

Ask, "How many ounces are there in a pound?" (16 ounces = 1 pound; therefore, 18 ounces = 1 pound 2 ounces.)

STRATEGY 2: cont'd

Using other premeasured bags of the same weight, ask students to weigh the bags. Ask the class to check their answers by multiplying.

6.10.02.03 **multiply units of liquid measure by a 1-digit multiplier and convert products to simplest form**

STRATEGY 1: Read the following problem to the students:

> A bottle of apple juice holds
> 1 pint 8 fluid ounces of liquid.
> There are three bottles of apple juice
> in John's refrigerator. How much
> apple juice does John have all together?

Ask the students, "What is the best mathematical operation we can use to solve this problem?" Write the example on the chalkboard.

e.g.,

1 pt 8 fluid ounces
x 3
___

Ask, "How do we multiply mixed units?" (To multiply mixed units: we first multiply each unit alone, working from right to left; whenever possible, we convert the smaller units to larger units.)

e.g.,

1 pt. 8 fluid ounces
x 3
___
3 pt. 24 fluid ounces

Ask, "How many ounces in a pint? How many in a quart?" (16 ounces = 1 pint, 2 pints = 1 quart.)

e.g.,

3 pt. 24 fluid ounces
1 pt. 8 fluid ounces
___
4 pt. 8 fluid ounces

2 quarts 0 pt. 8 fluid ounces

STRATEGY 1: cont'd

Emphasize, "We should always convert from right to left, starting with the smallest unit."

Repeat the above procedure with examples of varying difficulty.

STRATEGY 2:

Divide the class into groups of four students. Distribute an equal number of the same size empty commercial containers to each group, e.g., Group I is given 3 cans of tomato paste, each can containing 1 pint 2 fluid ounces.
Ask each group to compute the total amount of liquid their containers can hold all together.
Ask, "What is our best method to compute this answer?" (The best method to compute the answer is to multiply the liquid measure in one can by the total number of cans.)

Emphasize, "We multiply each unit alone working from right to left. Whenever possible, we convert the smaller units to larger units."
e.g.,

```
          1 pint   3 fluid ounces
          x        4
          _______________________
          4 pints 12 fluid ounces =
     4 pints 1 cup  4 fluid ounces
```

Repeat this procedure using examples of varying difficulty.

6.10.02.04 **multiply units of linear measure by a 1-digit multiplier and convert products to simplest form**

STRATEGY 1: Read the following problem to the students:

A tailor needs 1 yard 2 feet

STRATEGY 1:
cont'd

7 inches of cloth to make a coat. How much fabric does the tailor need to make five coats?"

Ask the students, "What operation can we use to solve this problem?" (Multiplication.) Write the example on the chalkboard.

e.g.,

$$\begin{array}{lrrr} & 1 \text{ yard} & 2 \text{ feet} & 7 \text{ inches} \\ \times & & & 5 \\ \hline \end{array}$$

Ask, "How do we multiply mixed units?" (To multiply mixed units: first multiply each unit alone, working from right to left; whenever possible, we convert the smaller units to larger units.)

e.g.,

$$\begin{array}{lrrr} & 1 \text{ yard} & 2 \text{ feet} & 7 \text{ inches} \\ \times & & & 5 \\ \hline & 5 \text{ yards} & 10 \text{ feet} & 35 \text{ inches} \end{array}$$

Ask, "How many inches are there in a foot?" (12 inches = 1 foot; therefore, 35 inches contains 2 feet 11 inches.) Ask, "How many feet are there in a yard?" (3 feet = 1 yard; therefore, 12 feet = 4 yards.)

e.g.,

$$\begin{array}{llll} & 5 \text{ yards} & 10 \text{ feet} & 35 \text{ inches} \\ + & & 2 \text{ feet} & 11 \text{ inches} \\ \hline & 5 \text{ yards} & 12 \text{ feet} & 11 \text{ inches} \\ & 4 \text{ yards} & & \\ \hline & 9 \text{ yards} & 11 \text{ inches} & \end{array}$$

Emphasize, "We should always convert from right to left, starting with the smallest unit."

Repeat the above procedure, using examples of varying difficulty.

STRATEGY 2: Divide the class into groups of four students each. Distribute precut oaktag strips to each group. All the strips given to one particular group should be of the same length, e.g., one group is given three 1-foot 7-inch strips.

The students in each group are required to compute, without measuring, the total length of the strips laid end-to-end. Ask, "What is our best method to compute this answer?" (The easiest way to compute the total length of the strips is to multiply the length of one strip by the total number of strips.) e.g.,

$$\begin{array}{lr} 1\text{ ft.} & 7\text{ in.} \\ \times & 3 \\ \hline \end{array}$$

Emphasize, "When we multiply mixed units we multiply each unit alone, working from right to left. Whenever possible, we convert the smaller units to larger units."

Ask the students to check their answers by measuring the strips laid end-to-end and convert the length to the appropriate units.
e.g.,

$$\begin{array}{lr} 1\text{ ft.} & 7\text{ in.} \\ \times & 3 \\ \hline 3\text{ ft.} & 21\text{ in.} \end{array}$$

$$\begin{array}{rlr} & 3\text{ ft.} & 21\text{ in.} \\ & 1\text{ ft.} & 9\text{ in.} \\ \cline{2-3} & 4\text{ ft.} & 9\text{ in.} \\ 1\text{ yd.} & 1\text{ ft.} & \\ \hline 1\text{ yd.} & 1\text{ ft.} & 9\text{ in.} \end{array}$$

Repeat this procedure, using other examples of varying difficuluty.

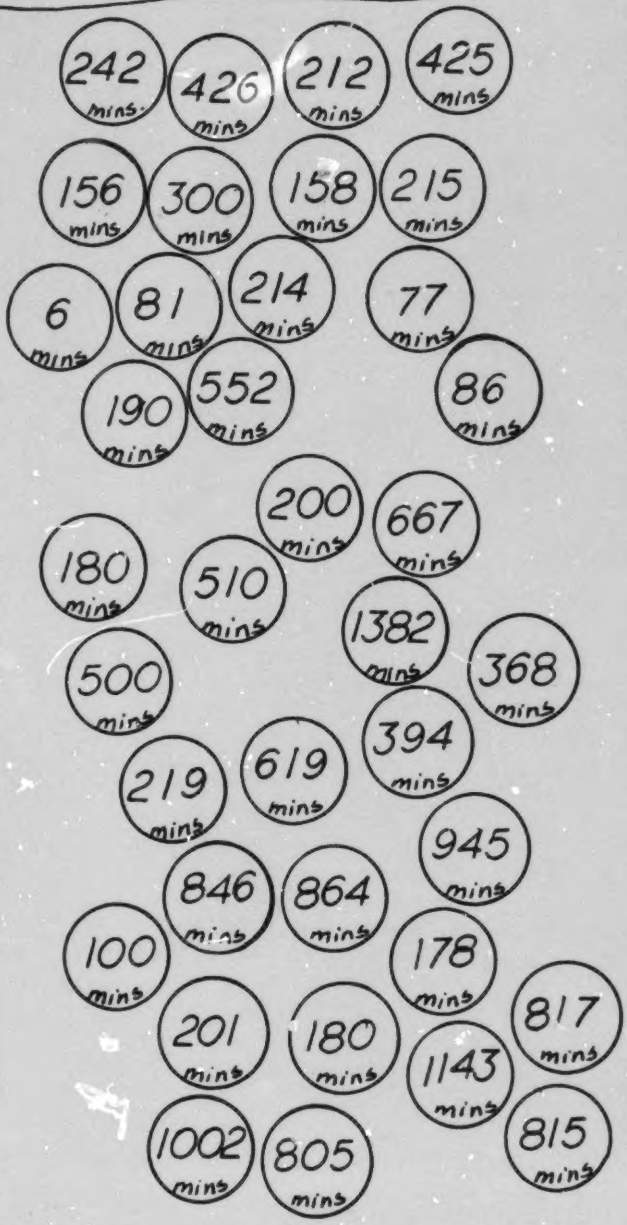
P.O. 6.10.02.01

NAME: ______________________ CLASS: __________ DATE: ________

12
1
2
3
4
5
6
7
8
9
10
11

Directions: Complete the chart and follow the answers obtained to draw a path through the maze.

Time	Convert To Minutes	Answer
4hrs 2mins	(4x60)+2	242
7hrs 6mins	(7x60)+6	
2hrs 38mins		
1hr 17mins		
9hrs 12mins		
3hrs 20mins		
8hrs 30mins		
11hrs 7mins		
23hrs 2mins		
5hrs 49mins		
10hrs 19mins		
14hrs 24mins		
2hrs 58mins		
19hrs 3mins		
13hrs 35mins		


242 mins.
426 mins
212 mins
425 mins
156 mins
300 mins
158 mins
215 mins
6 mins
81 mins
214 mins
77 mins
190 mins
552 mins
86 mins
200 mins
667 mins
180 mins
510 mins
1382 mins
368 mins
500 mins
394 mins
219 mins
619 mins
945 mins
846 mins
864 mins
100 mins
178 mins
817 mins
201 mins
180 mins
1143 mins
815 mins
1002 mins
805 mins

P.O. 6.10. 02.02

NAME: ______________________ CLASS: ________ DATE: ______

I. Multiply. Always convert the smaller units to larger units, where possible.

II. Solve the verbal problems.

I.

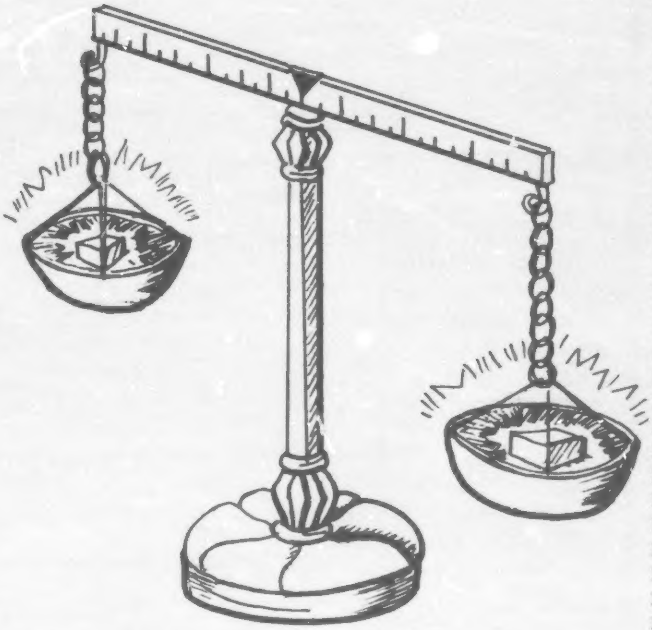
1. 2 pounds 3 ounces

x 8

2 pounds 24 ounces

1 pound 8 ounces

3 pounds 8 ounces



2. 1 pound 15 ounces

x 6

3. 7 pounds 8 ounces

x 9

4. 4 pounds 4 ounces

x 5

5. 5 pounds 1 ounce

x 7

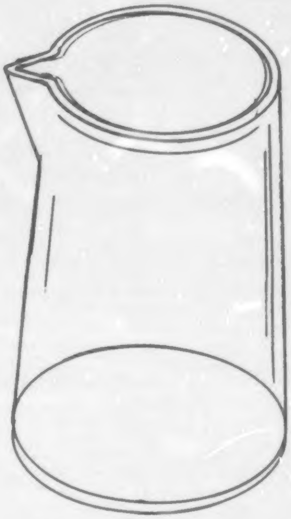
P.O. 6.10.02.03

NAME:__________________________________CLASS:________DATE:_______

Directions: Part I. Match the corresponding letter to the correct numeral.
Part II. List at least four different ways (using at least 2 different units together) that two gallons can be expressed.

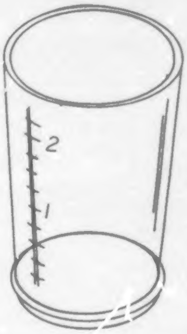
Part I

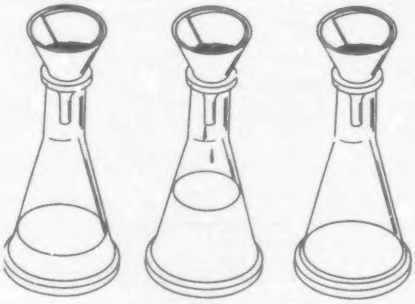
(d)	(1) 1 gallon	(a) 64 fluid ounces
___	(2) 1 cup	(b) 24 pints
___	(3) 1 pint	(c) 2 pints
___	(4) 1 quart	(d) 4 quarts
___	(5) 2 quarts	(e) 2 cups
___	(6) 3 gallons	(f) 8 fluid ounces

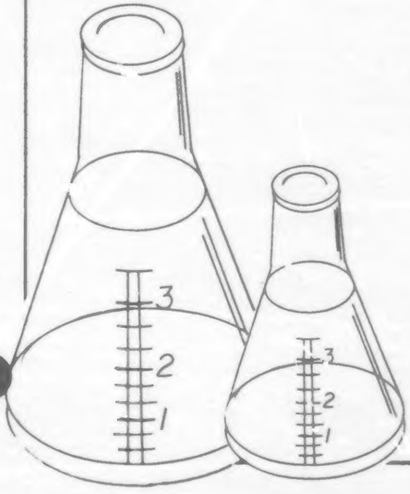


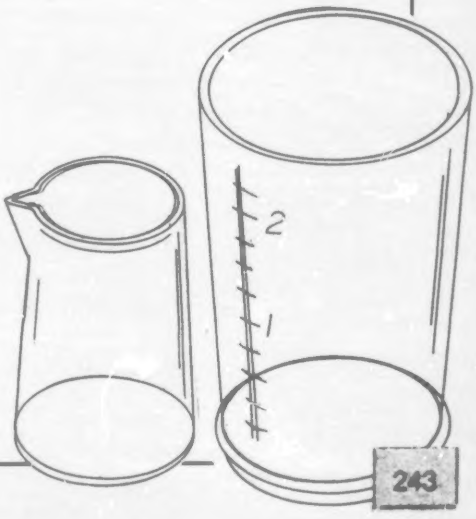
Part II

	Gallons	Quarts	Pints	Cups
a.	2 =	4	8	
b.	2 =			
c.	2 =			
d.	2 =			
e.	2 =			









6.14.09 TENTHS AND HUNDREDTHS IN DECIMAL FORM

(ongoing)

PERFORMANCE OBJECTIVES

The student will be able to...

6.14.09.01 write any proper fraction with a denominator of ten and one hundred as a decimal fraction;

e.g.,

$\frac{5}{10} = 0.5 \qquad \frac{5}{100} = 0.05$

6.14.09.02 identify the place value of digits in decimals expressed as tenths and hundreds.

e.g.,

0.5 = 0 ones + 5 tenths

0.25 = 0 ones + 2 tenths + 5 hundredths

263

6.14.09

VOCABULARY

TERMS

numerator
denominator
decimal
tenths
hundredths
equivalent

GETTING STARTED

Write these examples on the chalkboard:

e.g.,

Match:

$\frac{4}{100}$
$\frac{60}{100}$
$\frac{3}{10}$
$\frac{50}{100}$
$\frac{90}{100}$
$\frac{70}{100}$
$\frac{10}{100}$
$\frac{8}{10}$

$\frac{30}{100}$
$\frac{5}{10}$
$\frac{60}{100}$
$\frac{4}{10}$
$\frac{7}{10}$
$\frac{1}{10}$
$\frac{80}{100}$
$\frac{90}{100}$

Ask students to match the equivalent fractions.

Ask students to write two equivalent fractions for those written on the chalkboard.

e.g., $\frac{3}{10} = \frac{10 \times 3}{10 \times 10} = \frac{30}{100}$

Say, "Whatever is done to the numerator must be done to the denominator. The easiest way to find equivalent fractions is by multiplying by tens."

GETTING STARTED cont'd

Ask students to write two equivalent fractions for each example in their notebooks.

e.g.,

1) $\frac{6}{10} = \frac{\boxed{}}{100}$

2) $\frac{9}{10}$

3) $\frac{1}{10}$

4) $\frac{8}{10}$

5) $\frac{4}{10}$

6) $\frac{3}{10}$

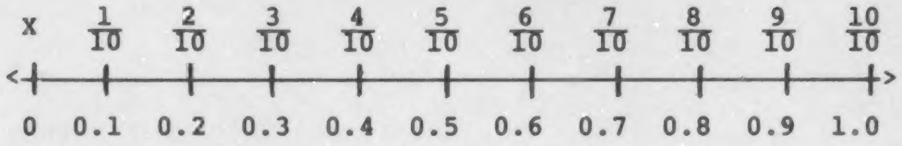
7) $\frac{7}{10}$

8) $\frac{5}{10}$

6.14.09

6.14.09.01 **write any proper fraction with a denominator of ten as a decimal fraction**

STRATEGY 1: Write this number line on the chalkboard:


x
$\frac{1}{10}$
$\frac{2}{10}$
$\frac{3}{10}$
$\frac{4}{10}$
$\frac{5}{10}$
$\frac{6}{10}$
$\frac{7}{10}$
$\frac{8}{10}$
$\frac{9}{10}$
$\frac{10}{10}$
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0

Ask, "What fractions are on top of the number line?" (Tenths)

Say, "A decimal point is used to separate the ones place from the tenths place. A decimal with the denominator ten is written one place to the right of the decimal point."

Ask, "How would we write $\frac{2}{10}$ as a decimal fraction?" (0.2) "How would we write $\frac{6}{10}$ as a decimal fraction?" (0.6) "How would we write $\frac{4}{10}$ as a decimal fraction?" (0.4) "How would we write $\frac{10}{10}$ as a decimal fraction?" (1.0) "Is the numeral to the right or left of the decimal point? Why?" ($\frac{10}{10}$ is one whole. Whole numbers are written to the left of the decimal point.)

Write this chart on the chalkboard.
e.g.,

Fraction	Equivalent Decimal
$\frac{3}{10}$	0.3
$\frac{9}{10}$	
$\frac{1}{10}$	
$\frac{8}{10}$	

6.14.09

STRATEGY 1:

Fraction	Equivalent Decimal
$\frac{6}{10}$	
$\frac{7}{10}$	
$\frac{5}{10}$	
$\frac{2}{10}$	
$\frac{4}{10}$	

Say, "Copy this chart into your notebook and fill in the equivalent decimal."

Repeat this procedure for hundreths.

STRATEGY 2: On 3" x 5" index cards, write a fraction or a decimal in tenths.

e.g.,

$\frac{3}{10}$	0.3	$\frac{95}{100}$	0.95
$\frac{5}{10}$	0.5	$\frac{72}{100}$	0.72
0.1	$\frac{1}{10}$	$\frac{81}{100}$	0.81

Distribute these cards to the students. Ask half of the students to go to the front of the room. Either pick the students holding the fraction cards or the students holding the decimal cards. You can mix the fractions and the decimals, if you wish, but be sure not to have two students in the front of the room whose cards are equivalent.

Say, "When I say, 'pair up', look around the room and find the student who is holding either the equivalent fraction or the equivalent decimal of the number on the card you are holding. Stand next to your partner."

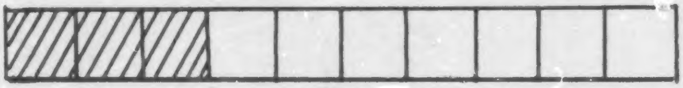
Repeat this procedure after collecting, reshuffling and then distributing the cards again.

6.14.09

6.14.09.02 **identify the place value of a digit in a decimal expressed as tenths and hundredths**

STRATEGY 1: Draw this diagram on the chalkboard.

e.g.,



Ask, "What fractional part of the whole is shaded?" $(\frac{3}{10})$ Ask, "What is the equivalent decimal?" (0.3)

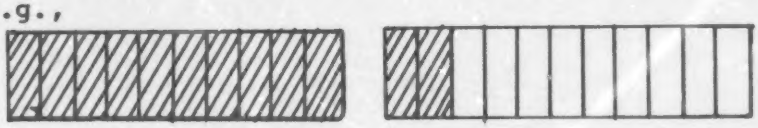
Write this example on the chalkboard.

e.g.,

0.3 = ☐ tenths

Ask, "What number will complete the number sentence?" (3) Draw this diagram on the chalkboard:

e.g.,



Ask, "What mixed number represents the shaded portion of the picture?" $(1\frac{2}{10})$ "What is the equivalent decimal?" (1.2)

Write this example on the chalkboard: 1.2 = ☐ ones and ☐ tenths

Ask, "What numbers will complete this number sentence?" 1 ones and 2 tenths.

Write this example on the chalkboard:

2.2 = ☐ ones and ☐ tenths

Ask a student to complete the number sentence. (2 ones and 2 tenths.)

Write this example on the chalkboard:

0.6 = ☐ ones and ☐ tenths

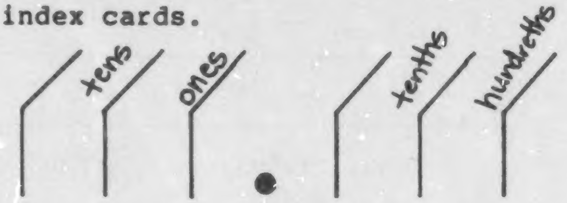
Ask a student to complete the number sentence. (0 ones and 6 tenths.)

Repeat this procedure using hundreths.

6.14.09

STRATEGY 2: Write this place value chart on the chalkboard. Draw this chart on a duplicating master and distribute on copy to each student. Ask each student to make numeral cards (0 through 9) on ten 3" x 5" index cards.

e.g.,



Say, "Place your finger on the tenths column. Count the spaces to the right of the decimal point. How many spaces do we have?" (1) Say, "When a decimal is written in tenths, the answer will contain one digit. Place your finger on the hundredths column. Count how many spaces to the right the hundredths column is from the decimal point." (Two spaces.)

Say, "When a decimal is written in hundredths, the answer will contain 2 digits.

Write $\frac{43}{100}$ on the chalkboard. Ask, "How many digits will our answer have?" (2) "Why?" (The denominator of our fraction is hundredths; therefore, our answer will have two digits.)

Repeat this procedure using other decimal numbers in tenths and hundreths.

P.O. 6.14.09.01

NAME: ____________________ CLASS: ________ DATE: ________

Directions: I. Write the decimal.
II. Complete the number sentences.

I.

a. seven tenths .7
b. nine tenths ____
c. eight hundredths ____
d. six tenths ____
e. four hundredths ____
f. five tenths ____
g. nine hundredths ____
h. one tenth ____
i. three hundredths ____
j. one hundredth ____
k. four and four tenths ____
l. three and seven tenths ____
m. nine and six tenths ____
n. five and twenty hundredths ____
o. one and fourteen hundredths ____
p. six and sixty-five hundredths ____
q. two and forty-one hundredths ____
r. eight and eleven hundredths ____
s. seven and twenty-nine hundredths ____
t. five and thirty-two hundredths ____

II.

		tens	ones	tenths	hundredths
a.	.27	____	____	2	7
b.	.64	____	____	____	____
c.	.46	____	____	____	____
d.	.99	____	____	____	____
e.	.82	____	____	____	____
f.	1.29	____	____	____	____
g.	2.64	____	____	____	____
h.	5.09	____	____	____	____
i.	12.15	____	____	____	____
j.	29.95	____	____	____	____

P.O. 6.14.09.02

NAME:______________________________ CLASS:__________ DATE:________

Directions: Complete this chart.

			△ ONES	⬭ TENTHS	▭ HUNDREDTHS
a	0.75	=	⇨	⬭	▭
b	0.66	=	⇨	⬭	▭
c	0.19	=	⇨	⬭	▭
d	0.27	=	⇨	⬭	▭
e	0.96	=	⇨	⬭	▭
f	0.86	=	⇨	⬭	▭
g	1.07	=	△	⬭	▭
h	3.16	=	△	⬭	▭
i	6.73	=	△	⬭	▭

6.10.03 METRICS

(1-2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.10.03.01A define meter, liter and gram using the following prefixes:

deci ($\frac{1}{10}$ of a standard unit)
centi ($\frac{1}{100}$ of a standard unit)
milli ($\frac{1}{1000}$ of a standard unit)
deka (10 standard units)
hecto (100 standard units)
kilo (1000 standard units)
e.g.,
decimeter, deciliter, decigram,
centimeter, centiliter, centigram,
milligram, dekagram, kilogram

6.10.03.02A draw approximate comparisons between metric units and customary units of measure.

e.g.,

(a) A yard is a little less than a meter (about 10% less).
(b) A foot is about 30 cm.
(c) An inch is about 2.54 cm.
(d) A quart is a little less than a liter.
(e) A pound is a little less than half a kilogram.
(f) A mile is about 1.6 km.

6.10.03

VOCABULARY

TERMS	**SYMBOLS**	**TERMS**	**SYMBOLS**
meter	m	yard	yd.
liter	l	foot	ft.
gram	gm	inch	in.
deci		quart	qt.
centi		pound	lb.
milli		mile	mi.
deka			
hecto			
kilo			

GETTING STARTED

Distribute various rulers to the students. Ask, "What do the numbers on the ruler indicate?" (Inches and parts of inches.) Ask, "How many inches are there in a foot?" (12) Ask, "What is the next larger measure of length? How many feet is it?" (A yard, 3 feet = 1 yard.) Ask, "What unit of measure would you use to determine the distance between New York and Washington?" (Miles.) Ask, "Besides measuring the length of objects, what other things do we measure?" (Our weight.) Ask, "What unit of measure is used to measure weight?" (Pounds and ounces.) Ask, "When you go to the store to buy milk, for what quanity do you ask for?" (Quart, half gallon and gallon.) Say, "These are all examples of measurements of capacity."

Students should assist in constructing a chart of the customary units of measure on the chalkboard.
e.g.,

Customary Units of Measure

Length
1 foot (ft.) = 12 inches (in.)
1 yard (yd.) = 36 inches (in.) = 3 feet (ft.)
1 mile (mi.) = 5280 feet (ft.) = 1970 yards (yds.)

Weight
1 pound (lb.) = 16 ounces (oz.)
1 ton = 2000 pounds (lbs.)

GETTING STARTED cont'd

Capacity

1 pint (pt.) = 2 cups
1 quart (qt.) = 2 pints
1 gallon (gal.) = 4 quarts
1 peck (pk.) = 8 quarts
1 bushel (bu.) = 4 pecks

Time

1 minute (min.) = 60 seconds (sec.)
1 hour (hr.) = 60 minutes
1 day = 24 hours
1 week = 7 days
1 year = 52 weeks = 365 days = 12 months
1 leap year = 52 weeks = 366 days = 12 months
1 decade = 10 years
1 century = 100 years

List the following items on the chalkboard and say, "Your mother sends you to the store to purchase the following items:"

Column A	Column B	Column A	Column B
milk		oil	
bread		candles	
aluminum foil		wrapping paper	
pie crust		scotch tape	
string		orange juice	
butter			

Ask, "How much milk would you buy?" (A quart, half-gallon or gallon.)
Ask, "How much bread would you buy?" (A pound loaf.)

Continue with this line of questionning for each item on the list. In column B write the unit of measure related to each item.

6.10.03

6.10.03.01 **define meter, liter and gram using the prefixes**

STRATEGY 1: Write the following word on the chalkboard in a box:

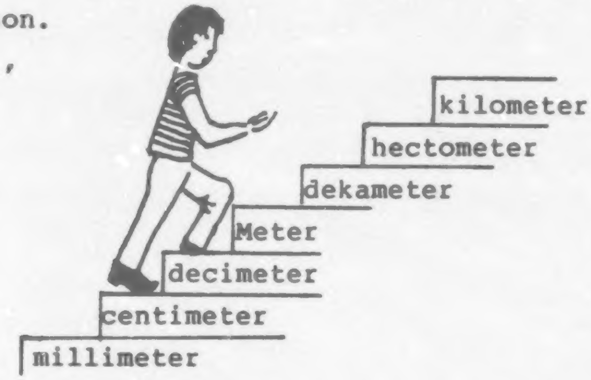
meter

Say, "A meter is the basic unit of length in the metric system. This system is the customary system used in other countries throughout the world. The metric system is based on ten, much like our monetary system of dollars and cents."

Say, "Let's construct a staircase to represent the metric system. As we climb to the top of our staircase, the units will get larger."

Display a paper figure of a man walking up the steps. Move the drawn figure to illustrate your lesson.

e.g.,



Ask, "Remembering that we are working with units of ten, how many decimeters do you think are needed to make one meter?" (10)

Ask, "What prefix has been added to the beginning of the word and what does it mean?" (The prefix "deci" means 10th.)

STRATEGY 1: cont'd

Say, "Let's move down a step to centimeter. What other word has the prefix centi and what is its meaning?" (A centipede is an insect which has 100 legs.)

Ask, "How many centimeters would we need to equal one meter?" (one hundred)

Say, "Let's move down a step to millimeter. Can anyone tell us what the prefix milli means?" (one thousandth)

Repeat this procedure, using dekameter, hectometer and kilometer to fill in the following chart: e.g.,

Metric Prefixes

prefix	milli	centi	deci	unit meter	deka	hecto	kilo
symbol	m	c	d	m	da	h	k
meaning	0.001	0.01	0.1	1.0	10	100	1,000

STRATEGY 2: Draw the following chart on the chalkboard. e.g.,

Prefix value	kilo	hecto	deka	unit	deci	centi	milli
			10	1			
				meter			

Say, "The metric system is a base ten system. Looking at the chart on the chalkboard, our reference point is the value one. Every number to the right gets smaller in value, while every number to the left gets larger in value."

Ask, "If our unit is meters, how many meters would be needed to move into the next column labeled 'deka'?" (Ten meters would make one dekameter.)

STRATEGY 2: cont'd

Ask, "How many meters would be needed to make one hectometer?" (One hundred.) Fill in one hundred on the chart.

Ask, "How many meters would be needed to make one kilometer?" (One thousand.) Fill in one thousand on the chart.

Ask, "Moving to the right, how many decimeters would be needed to make one meter?" (Ten.)Ask, "Therefore, one decimeter is what fractional part of a meter?" (One tenth.) Fill in the decimal 0.1 on the chart.

Ask, "How many centimeters would be needed to make one meter?" (100) Ask, "What fractional part of a meter is a centimeter?" (One hundredth or 0.01) Fill in the decimal on the chart.

Ask, "How many millimeters would be needed to make one meter?" (1000) Ask, "What fractional part of a meter is a millimeter and what is its decimal equivalent?" (One thousandth or 0.001) Fill in the decimal on the chart.

When the chart has been completed, orally review equivalents with the students.
e.g.,

"How many meters equal one kilometer?" (1,000)

"How many millimeters equal one meter?" (1,000)

"How many hectometers equal one kilometer?" (10)

"How many centimeters equal one decimeter?" (10)

Repeat this procedure using the suffixes for liter and gram.

6.10.03

6.10.02.02 **draw approximate comparisons between metric units and customary units of measure**

STRATEGY 1: Place an empty liter soda bottle on a table in front of the classroom next to a quart jar.

Ask a student to pour water into the quart container. Once the quart is filled, ask the student to pour the water from the quart into the liter bottle. Ask, "Which can hold more liquid, a liter of soda or a quart of soda?" (A quart is a little less than a liter.)

Tape three pieces of red ribbon on the chalkboard. One piece of ribbon should be a yard long, one a foot long and one an inch long. Ask a student to place a meter stick next to the yard of ribbon. Ask, "Which is longer, a yard or a meter?" (A meter is about 3 inches longer than a yard. A yard is a little less than a meter.)

Repeat this procedure, using other metric length comparisons.

Place a pound of spaghetti on a metric scale. Ask a student to read the weight on the scale. Ask, "Which is more, a pound or a gram?" (A pound is more than a gram.) Ask, "Which is more, a pound or a kilogram?" (A pound is a little less than half a kilogram.)

STRATEGY 2: Group the students at four tables. Distribute a piece of tracing paper which is more than a yard in length, and a piece of white paper the same length (approximately 40" x 20") to each group. Write up an index card for each group to use with this paper as follows:

> First, make three dark lines on the white paper. The first line will measure one yard, the second will measure one foot and the third will measure one inch. Label each line.
>
> Next, make three lines on the tracing paper. The first will measure one meter, the second will measure 30 cm and the third will measure 3 cm.

Write on the chalkboard, "How can we compare yards and meters, feet and centimeters, inches and centimeters?"

Students should put the tracing paper on top of the white paper so that they can see the differences in lengths.

Prepare similar index cards for metric weight and capacity. Repeat this procedure, letting each group do similar weighing and capacity experiments. The groups should discover the answers to the following questions:

> "Which is more liquid, a liter of water or a gallon of soda?" (The gallon of soda.)
>
> "Which is more, a pound or a centigram?" (A pound is more.)
>
> Which is more, a pound or a dekagram?" (A pound is more.)

P.O. 6.10.03.01

NAME: ______________________ CLASS: ________ DATE: ________

Directions: I. Complete the chart.
II. Write the word name for the equivalent metric measure.

I.

Prefix	Kilo	hecto	deka	Unit	deci	centi	milli
Value	1000			1			
	Kilometer			meter			
	Kiloliter			liter			
	Kilogram			gram			

II.

1) 10 meters dekameter
2) 100 meters ____________
3) 1000 liters ____________
4) 10 grams ____________
5) 1000 meters ____________
6) .01 of a liter ____________
7) .001 of a meter ____________
8) 10 liters ____________
9) 1000 grams ____________
10) .1 of a gram ____________
11) .01 of a meter ____________
12) .001 of a liter ____________
13) 100 liters ____________
14) 100 grams ____________

P.O. 6.10.03.02

NAME: ______________________ CLASS: ________ DATE: ________

Directions: Draw a line from Column A to Column B

CUSTOMARY MEASUREMENT	METRIC MEASUREMENT
A mile is	about 2.5 cm
An inch is	a little less than half a kilogram
A foot is	a little less than a liter
A pound is	about 30 cm
A quart is	about 1.6 km

6.07.01 DECIMAL NOTATION

(2-3 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.07.01.01A change fractions with denominators that are factors of multiples of ten to equivalent decimals ($\frac{1}{2}, \frac{1}{5}, \frac{1}{4}, \frac{1}{20}, \frac{1}{25}, \frac{1}{50}$, etc.); e.g.,

$$\frac{1}{4} = \frac{25}{100} = .25$$

$$\frac{2}{5} = \frac{4}{10} = .4 \text{ or } \frac{4}{100} = .40$$

$$\frac{3}{25} = \frac{12}{100} = .12$$

$$\frac{1}{20} = \frac{5}{100} = .05$$

6.07.01.02A write any proper fraction or mixed numeral with a denominator of 1000 as a decimal fraction; e.g.,

$$\frac{125}{1000} = .125$$

$$5\,\frac{413}{1000} = 5.413$$

$$3\,\frac{12}{1000} = 3.012$$

6.07.01.03A change fractions with denominators unrelated to multiples of ten, to equivalent decimals ($\frac{1}{3}$, $\frac{1}{8}$, $\frac{1}{6}$ etc.).

e.g.,

$$\frac{1}{8} = \frac{125}{1000} = .125$$

$$\frac{2}{3} = \frac{66\frac{2}{3}}{100} = .66\frac{2}{3} \text{ or } \frac{666\frac{2}{3}}{1000} = .666\frac{2}{3}$$

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6.07.01

VOCABULARY

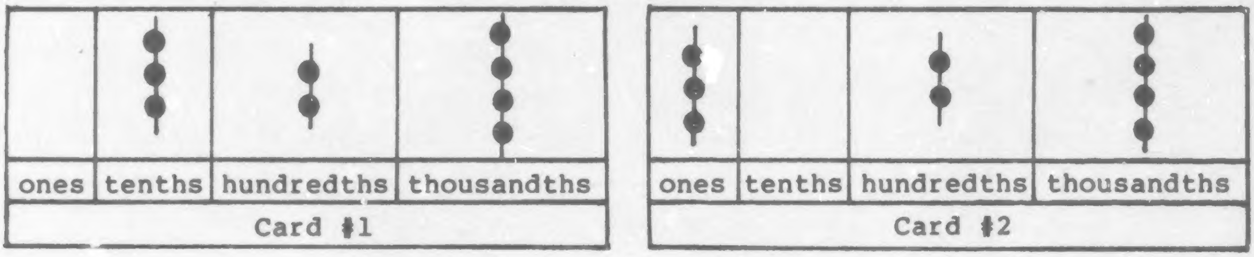
TERMS

whole numbers
tenths
hundredths
thousandths

GETTING STARTED

Make six place value cards cards, and tape them to the chalkboard. Say, "Silently read the values shown on each card and complete the statements on the activity sheet."
e.g.,

Place Value Cards

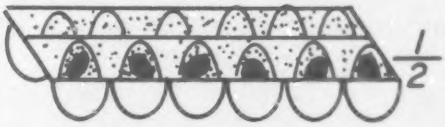

ones
tenths
hundredths
thousandths
Card #1
ones
tenths
hundredths
thousandths
Card #2

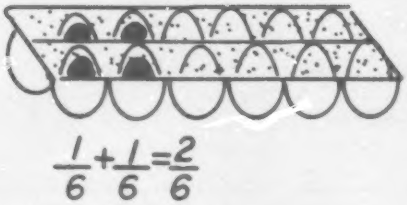
e.g., Student Activity Sheet

Statement	Value (Written As A Decimal)
A) 0 ones 3 tenths 2 hundredths 4 thousandths	0.324
B) 3 ones 0 tenths 2 hundredths 4 thousandths	3.024
C) _ ones _ tenths _ hundredths _ thousandths	
D) _ ones _ tenths _ hundredths _ thousandths	
E) _ ones _ tenths _ hundredths _ thousandths	
F) _ ones _ tenths _ hundredths _ thousandths	

GETTING STARTED cont'd

Use egg cartons and small beans to identify a given fraction.
e.g., show $\frac{1}{2}$ (use six out of twelve egg-holders) show $\frac{2}{6}$ (use four out of twelve egg-holders)





Each student should have his/her own egg carton and beans. Emphasize that there are other ways to represent the fractions $\frac{1}{2}$ and $\frac{2}{6}$, but that for now this way will be used. Ask the students to make up other fractions using their egg cartons and beans.

6.07.01

6.07.01.01 **change fractions with denominators that are factors of multiples of ten**

STRATEGY 1: Place these examples on the chalkboard:

$$\frac{7}{10}, \frac{2}{5}, \frac{12}{100}, \frac{2}{4}$$

Ask, "Which of these fractions can be easily renamed as a decimal?" ($\frac{7}{10}$ and $\frac{12}{100}$). Say, "$\frac{7}{10}$ and $\frac{12}{100}$ can be renamed easily because their denominators are multiples of 10. The fractions $\frac{2}{5}$ and $\frac{2}{4}$ are not multiples of 10, but they can also be renamed as decimals. How?" Say, "Any fraction of 10 or 100 can be changed into a decimal fraction and then into a decimal. If we can change any denominator to tenths or hundredths, we can rename the fraction as a decimal."

Display this list of common factors for 10 and 100 on grid paper on the chalkboard.

Factors of 10: 1, 2, 5, 10
Factors of 100: 1, 2, 4, 5, 10, 20, 25, 50, 100

Say "Let's try the example." Write on the chalkboard, "Change $\frac{2}{5}$ to a decimal."

Step 1 - Decide if the denominator is a factor of 10 or 100.

Step 2 - Change $\frac{2}{5}$ into a decimal fraction.

$$\frac{2}{5} \times \bigcirc = \frac{\bigcirc}{10} = \frac{2}{5} \times \frac{2}{2} = \frac{4}{10}$$

or

$$\frac{2}{5} \times \bigcirc = \frac{\bigcirc}{100} = \frac{2}{5} \times \frac{20}{20} = \frac{40}{100}$$

Step 3 - Change the decimal fraction into a decimal.

$$\frac{4}{10} = .4 \text{ or } \frac{40}{100} = .40$$

Repeat this procedure with other fractions.

6.07.01

STRATEGY 2: Let's play, "Make a Decimal." Distribute these materials to each pair of students: a number cube with the numbers 1, 2, 3, 3, 4, and 4; another cube with the numbers 5, 10, 20, 25, 50, 100 on each face; and one activity sheet.

Rules:

(1) Toss the number cubes.

(2) The lowest number shown will be the numerator. The largest number shown will be denominator.

(3) Write the fraction made on to the activity sheet.

(4) Change the fraction into a decimal fraction, if necessary.

(5) Change the fraction into a decimal.

e.g.,

John Tossed:	Fraction Made	Decimal Fraction	Decimal
3 20	$\frac{3}{20}$	$\frac{3}{20} \times \frac{5}{5} = \frac{15}{100}$	$= 0.15$

(6) Make as many different fractions as time permits. If a fraction has already been made toss the cubes again.

After the game has been played for five minutes, ask the students to name some of the fractions and decimals they made while another student makes a list on the chalkboard.

6.07.01

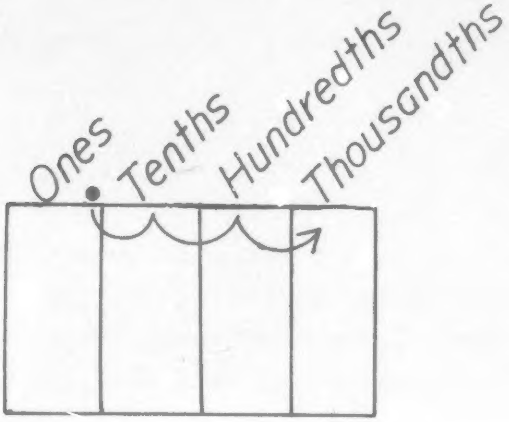
6.07.01.02 **write any proper fraction or mixed numeral with a denominator of 1000 as a decimal fraction**

STRATEGY 1: Prepare and distribute a place value chart to each student.

Ask, "What function does the decimal point have in the chart?" (It separates whole numbers from numbers less than one.) "Which columns on our place value chart indicate numbers less than 1?" (The tenths, the hundredths and the thousandths columns.)

Write $\frac{213}{100}$ on the chalkboard. Say, "Please read the fraction on the chalkboard. Is this number less than one?"
Ask several students the same question before giving the answer. (Yes.)

Discuss the position of the decimal point when writing $\frac{213}{1000}$ in decimal form. Ask, "What is the value of the denominator in $\frac{213}{1000}$? (Thousandths.) Point to the thousandths column on your place value chart. Count the number of columns to the right of the decimal point until you reach the thousandths column.
e.g.,



STRATEGY 1: cont'd

Say, "There are three columns to the right of the decimal point, including the thousandths column. Therefore, our fractional number when changed to a decimal must have three digits. On your activity sheet, place the digit 3 in the thousandths column, the digit 1 in the hundredths column and the digit 2 in the tenths column.

Repeat this procedure using other decimal numbers.

STRATEGY 2: Prepare and distribute a pocket place value chart and ten popsicle sticks for each student.

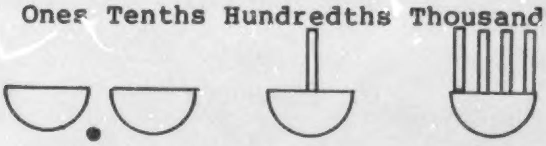
Write the fraction $\frac{14}{1000}$ on the chalkboard. Say, "Would you read the fraction for us?" (14 thousandths). Discuss that $\frac{14}{1000}$ can be written as shown in fractional form. It can also be written as a number name and it can be expressed in decimal form.

Ask, "Are there any whole numbers in $\frac{14}{1000}$? (No.) "What is the denominator in our example?" (1000) Point to the thousandths column on your pocket chart.

Count the number of columns to the right of the decimal point, until you reach the thousandths column.

e.g.,

Ones Tenths Hundredths Thousandths



.014 $\frac{14}{1000}$

Say, "There are three columns to the right of the decimal point including the thousandths column. Therefore, our fractional number must be expressed using three digits as a decimal."

STRATEGY 2: cont'd

Ask, "How will our decimal look?" Say, "Place four popsicle sticks in the thousandths column, one popsicle stick in the hundredths column, and nothing in the tenths column."

Repeat this procedure with other examples, using the pocket chart.

6.07.01.03 **change fractions, with denominators unrelated to multiples of ten to equivalent decimals**

STRATEGY 1: Write $\frac{1}{6}$ on the chalkboard. Ask, "What is the denominator?" (6) "Can we multiply 6 by any number to make it into tenths, hundredths, thousandths etc.?" (No.) "How can we change $\frac{1}{6}$ to an equivalent decimal fraction?" (We divide the denominator into the numerator.) Ask, "How can we divide 6 into 1?" (We change 1 into a decimal by placing a decimal point to the right of the 1 and add an appropriate number of zeros. The number of zeros depends on how many decimal places we need. Two zeros for two decimal places, three zeros for three decimal places, etc.)

STRATEGY 1: Illustrate the division example for changing $\frac{1}{6}$ to an equivalent decimal on the chalkboard.

e.g.,

$$\begin{array}{r} .16 \\ 6\overline{)1.00} \\ \underline{6} \\ 40 \\ \underline{36} \\ 4 \end{array}$$

Ask, "What is the answer?" $(.16\frac{4}{6} = .16\frac{2}{3})$. Ask, "How do we read this?" (Sixteen and two-thirds hundredths.) Say, "If, we continue to get remainders, we can round off our answer to a particular place."

e.g.,

$$\begin{array}{r} .166 = .17 \\ 6\overline{)1.000} \\ \underline{6} \\ 40 \\ \underline{36} \\ 40 \\ \underline{36} \end{array}$$

Repeat this procedure using other examples.

STRATEGY 2: Display the following chart.

e.g.,

Fraction	Decimal Fraction
$\frac{2}{7}$	
$\frac{5}{9}$	
$\frac{3}{11}$	
$\frac{5}{12}$	
$\frac{7}{13}$	

Ask, "Are any of the denominators of the fractions in the chart related to decimal fractions, e.g., tenths, hundredths, thousandths, etc.?" (No.) "How can we change $\frac{2}{7}$ into a decimal fraction?"

STRATEGY 2:
cont'd

Hint: "What mathematical operation does the fraction bar indicate?" (We divide 7 into 2. We convert 2 into a decimal by putting a decimal point to the right of the 2 and placing an appropriate number of zeros to the right of the decimal point, e.g., 2.00. Write the division example for changing $\frac{2}{7}$ to any equivalent decimal on the chalkboard.

e.g.,

```
        .28
     7)2.00
       1 4
       ----
         60
         56
         --
          4
```

Ask, "What is the equivalent decimal for $\frac{2}{7}$?" ($.28\frac{4}{7}$) "How do we read this?" (Twenty-eight and four-sevenths hundredths) Say, "If we do not want a fraction in our equivalent decimal we may put another zero and round our answer to the nearest hundredth.

e.g.,

```
        .285 = .29
     7)2.000
       1 4
       -----
         60
         56
         ---
          40
          35
```

Ask the students to complete the chart.

P.O. 6.07.01.01

NAME: ______________________ CLASS: __________ DATE: __________

Directions: Play Fraction-Decimal Concentration. Find the decimal and fraction cards which are equivalent.

A	B	C
D	E	F
G	H	I
J	K	L
M	N	O
P	Q	R

P.O. 6.07.01.01

NAME: ______________________________ **CLASS:** __________ **DATE:** ________

Directions: Play Fraction-Decimal Concentration. Find the decimal and fraction cards which are equivalent.

.24	$\frac{3}{4}$	.75
$\frac{1}{4}$	.25	$\frac{4}{50}$
.80	$\frac{2}{25}$	.32
$\frac{1}{2}$	.50	$\frac{4}{25}$
$\frac{2}{50}$	.20	.16
$\frac{3}{25}$	.12	$\frac{12}{50}$

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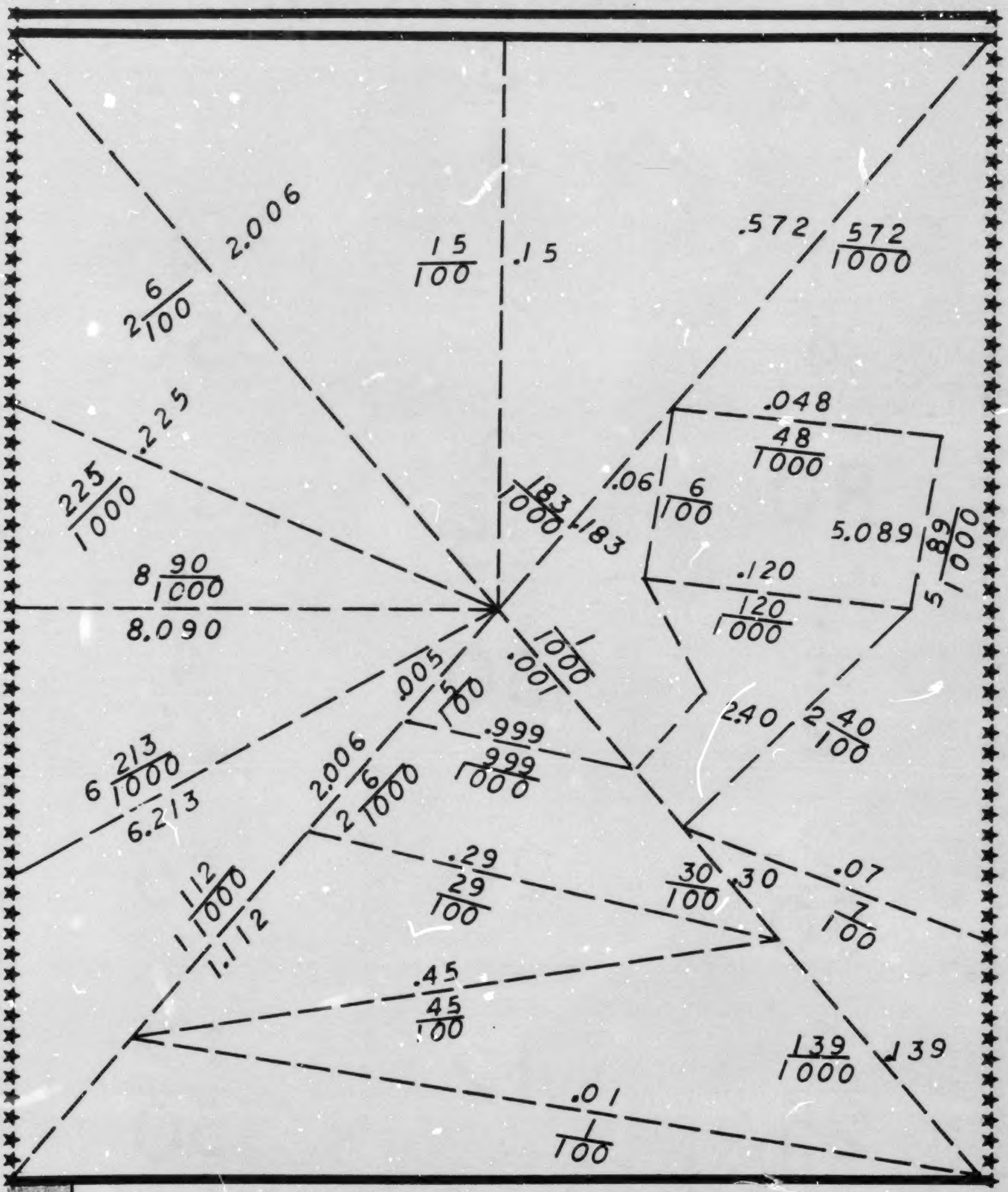
P.O. 6.07.01.02

NAME:______________________________**CLASS:**__________**DATE:**__________

Directions: Change the fractions into decimals making sure to reduce them to lowest terms if necessary. (Proceed to next page.)

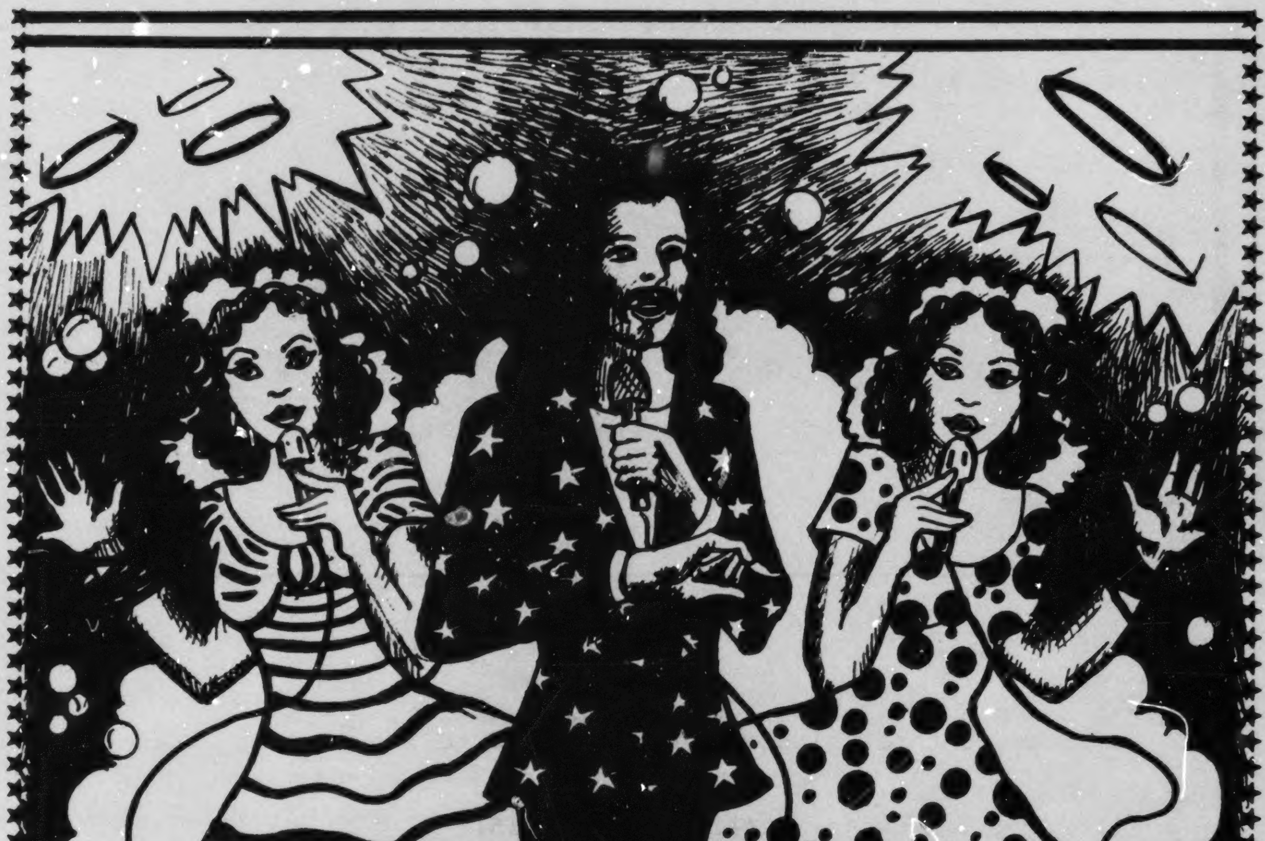


2.006
$2\frac{6}{100}$
$\frac{15}{100}$
.15
.572
$\frac{572}{1000}$
.225
$\frac{225}{1000}$
$\frac{183}{1000}$
.183
.06
$\frac{6}{100}$
.048
$\frac{48}{1000}$
5.089
$5\frac{89}{1000}$
$8\frac{90}{1000}$
8.090
.120
$\frac{120}{1000}$
$\frac{1}{1000}$
.001
.005
$\frac{5}{100}$
.999
$\frac{999}{1000}$
2.40
$2\frac{40}{100}$
$6\frac{213}{1000}$
6.213
2.006
$2\frac{6}{1000}$
$1\frac{112}{1000}$
1.112
.29
$\frac{29}{100}$
$\frac{30}{100}$
.30
.07
$\frac{7}{100}$
.45
$\frac{45}{100}$
$\frac{139}{1000}$
.139
.01
$\frac{1}{100}$

P.O. 6.07.01.02

NAME:______________________________CLASS:__________DATE:________

Directions: Cut and match the decimal to the fraction. Flip the pieces when completed. If your answers are correct, you will find the hidden picture.



P.O. 6.07.01.03

NAME:____CLASS:_________DATE:_______

Directions: I. Change the fractions to equivalent decimal fractions. Complete to three places and then round to the nearest hundredth.

I

(1) $\frac{3}{7}$ = .43 or 42 $\frac{4}{7}$

(2) $\frac{2}{9}$

(3) $\frac{4}{11}$

(4) $\frac{5}{12}$

(5) $\frac{6}{13}$

(6) $\frac{1}{14}$

(7) $\frac{7}{15}$

(8) $\frac{3}{16}$

(9) $\frac{2}{17}$

(10) $\frac{1}{18}$

II

Match the equivalent decimal to the fraction.
Complete to three places and then round to the nearest hundredth.

(11) $\frac{7}{12}$	(a) .44	(16) $\frac{3}{13}$	(f) .45
(12) $\frac{6}{7}$	(b) .47	(17) $\frac{4}{15}$	(g) .05
(13) $\frac{1}{14}$	(c) .58	(18) $\frac{1}{21}$	(h) .27
(14) $\frac{7}{16}$	(d) .86	(19) $\frac{5}{11}$	(i) .23
(15) $\frac{9}{19}$	(e) .07	(20) $\frac{8}{9}$	(j) .89

6.07.02 COMPARE NUMBERS IN DECIMAL NOTATION

(2 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.07.02.01A compare a given decimal by hundredths or thousandths;

e.g.,

0.47 is one hundredth more than .046
0.02 is one hundredth less than .03
0.038 is one thousandth more than .037
0.299 is one thousandth less than .3

6.07.02.02A solve word problems related to skills learned in this module.

e.g.,

Pedro has $0.25.
Juan has $0.36.
Larissa has $0.29.

Who has the greatest amount of money? Juan has the greatest amount of money because $0.36 is greater than $0.25 and $0.29.

$0.36 > $0.25
$0.36 > $0.29

Who has the least amount of money? Pedro has the least amount of money because $0.25 is less than $0.29 and $0.36.

$0.25 < $0.29
$0.25 < $0.36

6.07.02

VOCABULARY

TERMS	**SYMBOLS**
greater than	>
less than	<
tenth	0.1
hundredth	0.01
thousandth	0.001
decimal	.
equal to	=

GETTING STARTED

Write the following activity on the chalkboard:

Write the word name for each decimal fraction:

1) 0.8 =(eight tenths)
2) 0.05 = (five hundredths)
3) 0.12 = (twelve hundredths)
4) 3.009 = (three and nine thousandths)
5) 0.236 = (two hundred thirty six thousandths)

Write the decimal fraction for each word name:

6) four tenths = (0.4)
7) three hundredths = (0.03)
8) six and twenty-four hundredths = (6.24)
9) seventeen thousandths = (0.017)
10) two hundred four thousandths = (0.204)

Give the students time to fill in their answers. Ask different students to write their answers on the chalkboard. If a student gives an incorrect answer, ask the student to compute the answer that he/she has given using the class place value chart.

e.g.,

	ONES	TENTHS	HUNDREDTHS	THOUSANDTHS
Student answer 0.08 ——>	0 .	0	8	
Correct answer is: 0.08	0 .	8		

Then ask the student to read his/her answer using the place value chart as a guide. Ask all of the students to check their answers with the correct ones written on the chalkboard.

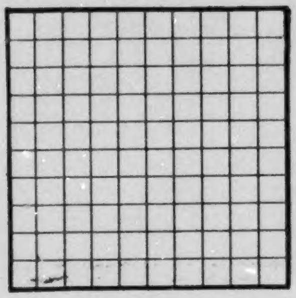
GETTING STARTED cont'd

Prepare sets of 10 x 10 grids for each student and a class set of crayons, colored markers, or colored pencils. Give each student an envelope with five 10 x 10 grids.

Say, "Remove one grid from your envelope and count the number of squares on your grid. How many squares are on the grid?" (100) Ask, "How many squares are in each row?" (10) "How many groups of ten squares are there on the entire grid? (10)

Say, "Shade in one group of 10 squares in a row." Model this activity at the chalkboard. "We call the part that is shaded one tenth, $(\frac{1}{10})$."

e.g.,



Say, "In fractional notation, we write this as $\frac{1}{10}$. In decimal notation, we write $\frac{1}{10}$ as 0.1." Write $\frac{1}{10} = 0.1$ on the chalkboard. Say, "Please write this example in your notebook."

Say, "Take out another grid and shade in four tenths $(\frac{4}{10})$. Write the amount shaded in fractional and decimal form, $(\frac{4}{10} = 0.4)$."

After giving the students ample time to complete this part of the activity, you may model the correct answer on a 10 x 10 grid.

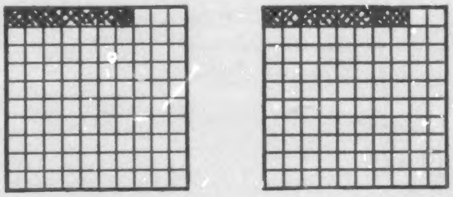
Continue this procedure using different decimal fractions.

6.07.02

6.07.02.01 **compare a given decimal by hundredths or thousandths**

STRATEGY 1: Prepare sets of 10 x 10 grids for each student. Ask each student to have a pencil ready to complete this activity. Say, "Take out two of your grids. On one grid shade seven of the squares." Give the students time to shade in their grids. Model shading on a demonstration grid at the chalkboard.

e.g.



Say, "On the other grid, shade eight of the squares." Give the students time to shade in their grids.

Ask, "Which grid has the most squares shaded?" (The grid with eight squares shaded.) What is the decimal name for the eight squares that we have shaded?" (0.08) "Which grid has the least number of squares shaded?" (The grid with seven squares shaded.) "What is the decimal name for the seven squares that we have shaded?" (0.07) Say, "We say 0.08 is greater than 0.07 because 0.08 is one hundredth more than 0.07. In a number sentence, we can write 0.08 > 0.07."

Write this number sentence on the chalkboard as the students write it in their notebooks.

Say, "Take out two more grids. On one grid, shade in 47 squares. On the other grid shade in 46 squares." Give the students time to shade in their grids.

6.07.02

STRATEGY 1: Say, "What is the decimal name for the grid with 47 squares shaded? (0.47) What is the decimal name for the grid with 46 squares shaded? (0.46) Which grid has the least number of squares shaded? (The grid with 0.46 squares shaded) Why is 0.46 smaller than 0.47?" (0.46 is one hundredth less than 0.47.)

Ask the student to write a number sentence to show that 0.46 is less than 0.47.

e.g.,

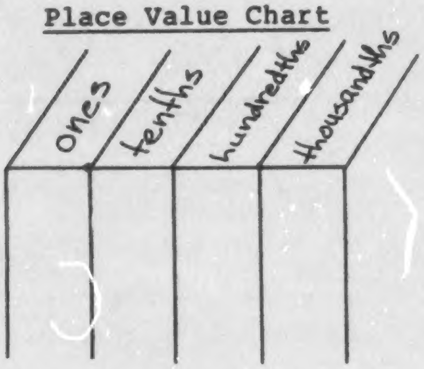
$0.46 < 0.47$

Repeat this procedure using other decimal fractions.

STRATEGY 2: Prepare a class size place value chart and tape it to the chalkboard. Ask the students to copy into their notebooks, or prepare a rexograph sheet for them.

e.g.,

Place Value Chart

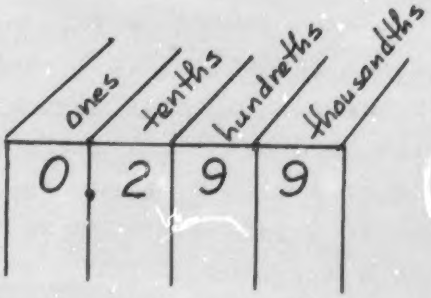


Say, "Which number is greater, 0.299 or 0.3?" Let's use the place value chart to help us find the answer. Place the number 0.299 in the correct places in the chart."

6.07.02

STRATEGY 2: cont'd

e.g.,

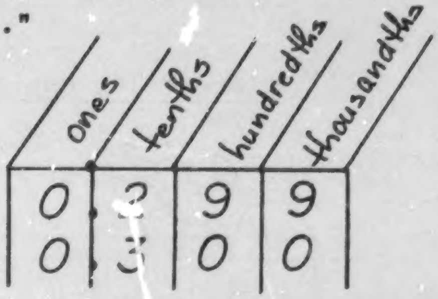

ones
tenths
hundredths
thousandths
0.299

Say, "Now place 0.3 in the correct place on the chart. To help us compare decimals which do not have the same number of decimal places, we may write zeros after the last digit in the numeral. e.g.,

0.300

Say, "Adding zeros after the last digit of a decimal numeral does not change the value of that numeral. Now compare 0.299 to 0.300. Which number is greater? Use your place value charts to help you find out."

e.g.,


ones
tenths
hundredths
thousandths
0.299
0.300

Say, "0.3 (3 tenths) is one thousandth greater than 0.299 (two hundred ninety-nine thousandths). 0.299 is one thousandth less than 0.3."

Complete these number sentences, using the symbols for greater than (>) or less than (<). Write on the chalkboard: 0.3____0.299

0.299__0.3

Repeat this procedure, using other decimal fractions and the place value chart.

6.07.02

6.07.02.02 solve word problems related to skills learned in this module

STRATEGY 1: Distribute one copy of the rexographed number story, "Decimal Dash," to each student (see next page).

Say, "Read through this story completely before you begin to solve it." Ask a student or several students to read the clues aloud to the class.

Ask, "What is the question in this story?" (Who won the race?) Give the students at least five minutes to read the story and begin to answer it.

Point out that the fastest runner is the girl with the least amount of running time in minutes and seconds.

Discuss the vocabulary in this story; "between, less than, greater than."

Say, "It may be helpful for you to make a chart giving the time that each girl ran."
e.g.,

Runner	Time Ran	(Answers)
A		6.6
B		7.7
C		5.7
D		7.5
E		6.1

Runner C won the race

100 Yard Decimal Dash

Five girls ran a 100-yard dash. Their times have been recorded, but the winner has not been announced. Use the clues below to determine the winner.

CLUES:

STRATEGY 1: cont'd

The runner who wore letter A had a time between 6.5 and 6.7. (____)

The runner who wore letter B had a time that was one-tenth of a second less than 7.8. (____)

The runner who wore letter C had a time of one-tenth more than 5.6. (____)

The runner who wore letter D had a time of two tenths less than the girl who wore letter B. (____)

The girl who wore letter E had a time that was one-tenth of a second between 6.0 and 6.2. (____)

STRATEGY 2: Distribute a set of supermarket or newspaper sales circulars which show food sales. Use the circular to generate questions concerning comparison of decimal fractions.

Say, "Which costs more, whole chickens which sell for 49¢ per pound, or chicken parts which sell for 59¢ per pound? Why? (Chicken parts, because it costs money to have them cut up.) How much more do chicken parts cost than the cost of a whole chicken?" ($0.10 more per pound.)

Say, "You have $1.50. Can you buy boiled ham at $1.59 or bacon at $1.39?" (You can buy the bacon.)

Say, "You have $3.50. List some of the items that you can buy. List some of the items that can't buy." (Various answers can be given, according to the circular.)

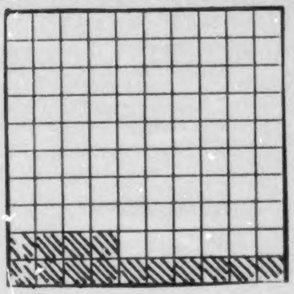
305

P.O. 6.07.02.01

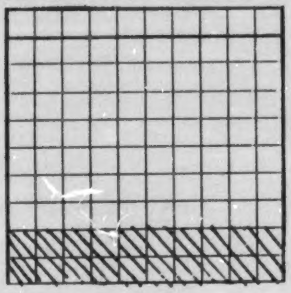
NAME: ______________________ CLASS: ________ DATE: ______

Directions: Write the number of shaded squares in decimal notation. Compare the decimal numerals using > or < symbols.

I.



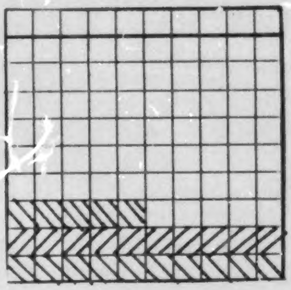
0.14 SQUARES SHADED



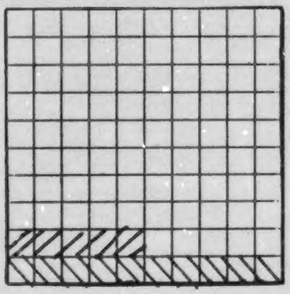
0.20 SQUARES SHADED

0.14 (<) 0.20

A



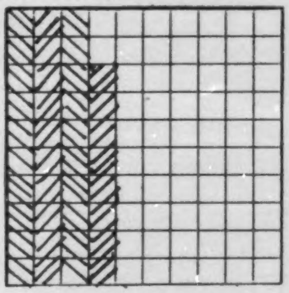
____ SQUARES SHADED



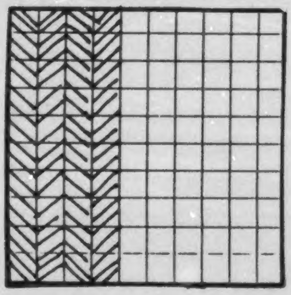
____ SQUARES SHADED

____ ○ ____

B



____ SQUARES SHADED



____ SQUARES SHADED

____ ○ ____

II.

1) 5.04 ____ 5.03
2) 0.38 ____ 0.83
3) 8.7 ____ 8.12
4) 0.24 ____ 1.08
5) 0.07 ____ 0.12
6) 0.5 ____ 0.499
7) 1.31 ____ 1.09
8) 0.908 ____ 0.98
9) 0.81 ____ 0.081
10) 0.005 ____ 0.05

P.O. 6.07.02.02

NAME:____ CLASS:_________ DATE:_______

Solve:

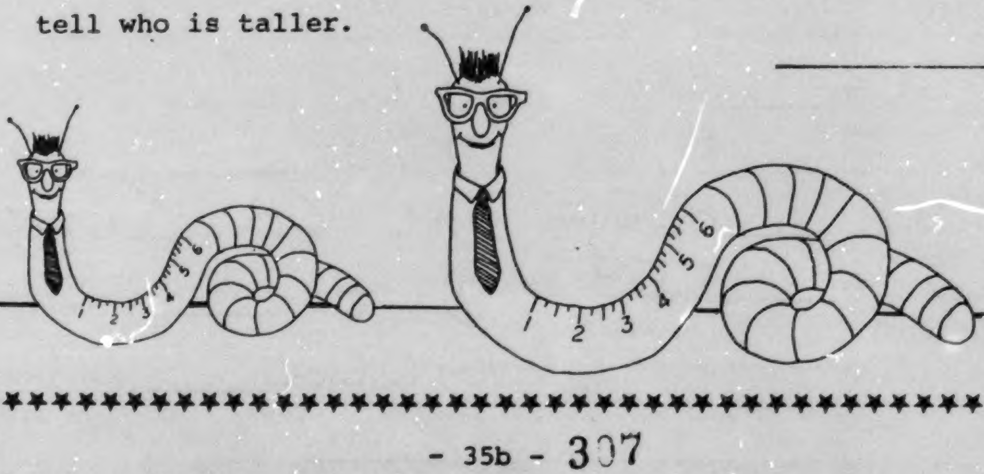
1. Randy has a jump rope that measures 0.75 m. Janice has a jump rope that measures 0.67 m. Who has the longer jump rope? _______________

2. Tony lives 27.6 km from the library. Alan lives 27.9 km from the library. Who lives the farthest from the post office? _______________

3. Store A sells a liter bottle of soda for $1.39. Store B sells a liter bottle of soda for $1.27. Which store has the better buy? _______________

4. A chef measured 0.13 g of salt for an egg recipe and 0.2 g of salt for a salad recipe. In which recipe was more salt used? _______________

5. Mary is 147.32 centimeters tall. Susan is 147.52 centimeters tall. Write a number sentence using the symbol > or < to tell who is taller. _______________



Unit 23

6.07.03 ROUND DECIMALS

(1 lesson)

PERFORMANCE OBJECTIVES

The student will be able to...

6.07.03.01A round decimals in hundredths to the nearest tenth;

e.g.,

0.26 rounds to 0.3

365.31 rounds to 365.3

6.07.03.02A round decimals in thousandths to the nearest hundredth.

e.g.,

0.428 rounds to 0.43

6.07.03

VOCABULARY

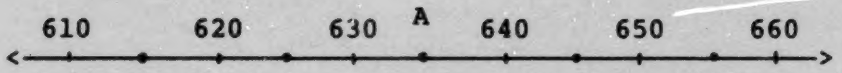
TERMS

whole number
round down
round up
tenths
hundredths
thousandths

GETTING STARTED

Draw the following number line on the chalkboard.

e.g.,



Ask, "What is the rule for rounding whole numbers?" (If the numeral to the right of the place to which we are rounding is five or greater, round up. If the numeral is less than five, round down.)

Ask, "At what value on the number line is the letter A?" (637 or 638.) If the value 638 is used, how do we round 638 to the nearest 10?" (Circle the numeral in the tens column, 6 3 8. Look at the next digit to the right of the number circled, 6 3 8. If that number is 5 or greater, round up.)

e.g., 638 ——> 640

Try rounding to the nearest ten.

1) 642 → 640	3) 625 → 630	5) 637 → 640
2) 613 → 610	4) 632 → 630	6) 658 → 660

Note: Answers are for teacher reference only.

Match the value of the numeral 4 to its number name.

420.5
168.4
92.24
41.158
1.054
4.73

ones
tens
thousandths
tenths
hundred
hundredths

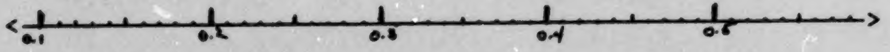
309

6.07.03

6.07.03.01 **round decimals in hundredths to the nearest tenth**

STRATEGY 1: Prepare and distribute a number line similar to the one below.

e.g.,



Say, "This number line shows hundredths. Find 0.25, 0.42 and 0.64. Can you find 0.48 on your number line? Let's round 0.48 to the nearest tenth."

Circle the numeral in the tenths column.

e.g.,

0.48

Underline the digit to the right of the circled digit.

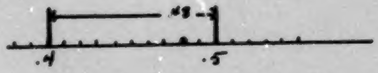
e.g.,

$0.4\underline{8}$

Since 8 > 5, round up to the next tenth.

Therefore, 0.48 rounded to nearest tenth equals 0.5."

Say, "Let's check our answer with our number line. The 0.48 appears to be closer to 0.5 than 0.4.



Say, "Try rounding the following numbers,to the nearest tenth."

(A)	(B)	(C)	(D)
0.56 (0.6)	0.88 (0.9)	0.72 (0.7)	0.75 (0.8)

Check your answer by referring to your number line.

STRATEGY 2: Prepare and distribute the chart below to each student. Say, "Listed below are the results of four sprinters' times. Round each sprinter's time

STRATEGY 2: cont'd

to the nearest tenth."

Display the following chart:

Sprinter I	12:15 is rounded to	____
Sprinter II	13:21 is rounded to	____
Sprinter III	14:17 is rounded to	____
Sprinter IV	14:06 is rounded to	____

Say, "The first sprinter's time is 12.15. Look at the digit in the tenths column. Circle it. (12.15). Underline the digit to the right of it (12.15). If the underlined digit is five or more, round up. (Add 1 to tenths column.) If the digit is less than 5, round down. Find the second sprinter's time rounded to the nearest tenth on your clock." Repeat this procedure for the third and fourth sprinter.

Using a stop watch, time how fast a student can walk around the room and then go back to his/her seat. Round the time to the nearest tenth. Time students doing other activities and then round the time to the nearest tenth.

Similarly, you can create many activities using a stop watch to teach students to round down and up.

6.07.03.02 **round decimals in thousandths to the nearest hundredth**

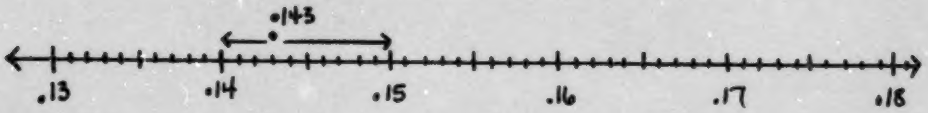
STRATEGY 1: Prepare and give each student a number line.

Say, "Any decimal can be rounded in the same manner as you round to the nearest tenth or hundredth." e.g.,

Round 0.143 to the nearest hundredth. First

STRATEGY 1: cont'd

circle the digit in the hundredths column. (0.143) Then underline the digit to the right of the circled numeral. If the underlined digit is five or greater, round up. If the underlined digit is less than five, round down. Since 3 < 5, round down and drop off other digits to the right of the hundredths column. (0.14)



Say, "Try rounding these decimals to the nearest hundredth."

(a) 0.164 (0.16) (b) 0.178 (0.18) (c) 0.153 (0.15)

Check your answers on your number line.

STRATEGY 2: Prepare and distribute a place value pocket chart and numeral cards (1 through 9) to each student.

Show a card to the students.
e.g.,

$\boxed{0.875}$

Ask a student to read the card, "Eight hundred seventy-five thousandths."

Ask, "What digit stands in the tenths column? (8)
"What digit stands in the hundredths column? (7)
"What digit stands in the thousandths column?" (5)

Say, "We want to round 0.875 to the nearest hundredth. How can we do this?"

Say, "First, look at the digit in the column that must be rounded. (The hundredths.) Circle that digit."
e.g.,

0.8⑦5

Ask, "What is the digit to its right?" (5) If the digit to the right of the hundredth is five or greater add one to the hundredth number and drop off the other

STRATEGY 2: cont'd

numbers to the right of the hundredths place."

0.875 rounded to nearest hundredth is 0.88.

Say, "If the number to the right of the hundredths column is less than five, leave the rounded number in the hundredths column as it is and drop all of the numbers to the right."

Repeat this procedure using other decimal numbers.

P.O. 6.07.03.01&02

NAME:______________________________ CLASS:__________ DATE:________

Round to the nearest whole number.

a) 24.6 (b) 5.2 (c) 246.95 (d) 16.97

______ ______ ______ ______

Round to the nearest tenth.

a) 7.13 (b) 2.65 (c) .84 (d) 5.78

______ ______ ______ ______

Round to the nearest hundredth.

a) 1.982 (b) .468 (c) .213 (d) 27.049

______ ______ ______ ______

Unit 24

6.07.04 PERCENT

(3-4 lessons)

PERFORMANCE OBJECTIVES

The student will be able to...

6.07.04.01A write a percent as a decimal;

e.g.,

14% = .14

72% = .72

6.07.04.02A express fractions and decimals as an equivalent percent;

e.g.,

$$\frac{1}{4} = \frac{25}{100} = 0.25 = 25\%$$

$$\frac{1}{8} = 8\overline{)1.000} = 12\frac{1}{2}\%$$

6.07.04.03A solve word problems related to skills learned in this module.

e.g.,

It took Dennis 1 hour and 40 minutes to complete his homework. His mathematics homework took 40 minutes and his science homework took 20 minutes.

What percent of the total time did his mathematics homework take?

1 hour 40 minutes = 100 minutes

```
         .40    = 40%
    100)40.00
        40 0
           0
```

It took Dennis 40% of the time to complete his mathematics homework.

What percent of the total time did his science homework take?

```
          .20   = 20%
     100)20.00
         20 0
            0
```

It took Dennis approximately 20% of the time to complete his science homework.

6.07.04

VOCABULARY

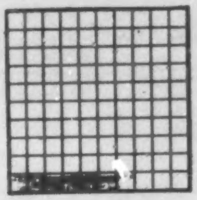
TERMS	**SYMBOLS**
percent	%
decimal	
fraction	
graph	

GETTING STARTED

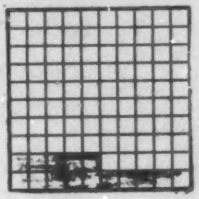
Prepare the following worksheet for each student.

e.g.,

Write a decimal numeral for the number of shaded squares in each picture.

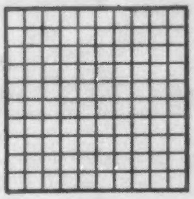


0.07

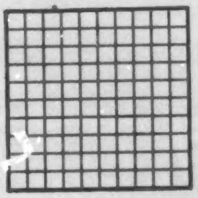


0.15

Shade in the proper number of squares on the grid.



0.18



0.09

GETTING STARTED cont'd

Say, "In Part I, write a decimal numeral for the shaded squares of each picture. Let's do number 1 together."

Give the students time to count and name the number of shaded squares. Ask, "How many squares are on the grid?" (100.) "How many squares are shaded?" (7) "What is the decimal numeral for the seven shaded squares?" (0.07) "Seven hundredths are shaded because seven of the 100 squares are shaded."

Ask the students to complete Part I. Review the answers.

Say, "In Part II, you are asked to shade in the number of squares on the grid to match the decimal or fractional name under each grid. Let's do the first one together."

Give the students time to read and shade in the grid.

Say, "What decimal numeral is under grid number 6?" (0.18) "How many squares should you shade in on the grid?" (18)

Say, "Now finish the other grids." Review the answers with the students.

Prepare the following materials for pairs of students: 1 money trading game mat; one 0 through 5 number cube; one 5 through 10 number cube; one set of play money per student with 10 pennies, 5 nickels, 5 dimes, 4 quarters, 2 half-dollars and 1 dollar; and one paper cup in which to place the play money. The object of the game is to trade money on the mat until a student reaches one dollar.

Say, "We are going to play The Money Game."

Give out the materials to each student. Say, "Look at your game mats. There are pictures of pennies, nickels, dimes, quarters, half-dollars and dollars. There are spaces under each picture where you will place your money."

GETTING STARTED cont'd

Ask, "How many pennies do you need to make a nickel?" (5) "How many nickels do you need to make a dime?" (2) "How many dimes do you need to make a half-dollar?" (5) "Name different ways you can make a quarter." (Two dimes and a nickel; five nickels, three nickels and one dime; and one dime, two nickels, five pennies.) "How many quarters do you need to make one dollar?" (4) "How many half-dollars do you need to make one dollar?" (2) More money relationships may be reviewed with the students.

Explain the rules of the game. For demonstration purposes, use one game mat, demonstration money and one 0 through 5 number cube. Pick one student to roll the cube for the class.

Say, "I will roll the number cube and call out the number which shows. You will place the same number of pennies on the mat in the space under the picture of the penny."

Roll the cube and place the corresponding number of pennies on the mat. Ask the students to do the same.

Say, "Now, I'll roll the cube again and add the number of pennies to what was in the penny space before." Do this with the students.

Say, "Let's count the number of pennies in the space. If we have five pennies we can trade them for a nickel. In this game, we are never allowed to place more than five pennies in the penny space at one time."

Do the trading of one nickel for five pennies with the students.

Say, "Whenever we roll the cubes, we must place the corresponding number of pennies in the penny space. The winner is the first person to get $1.00 in the dollar space."

Play the game with the class. Then divide the students into groups and allow them to play the game on their own.

e.g., Game Mat

Dollar	Half-Dollar	Quarter	Dime	Nickel	Penny

6.07.04

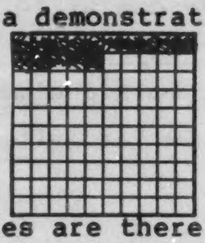
6.07.04.01 **write a percent as a decimal**

STRATEGY 1: Prepare student sets of 10x10 grids and a set of colored pencils, markers or crayons. Distribute these materials to each student.

Ask the students to take one of the grids from the set. Say, "Shade in 15% of your grid." Model this for the students on a demonstration grid on the chalkboard.

e.g.,

15% shaded



Say, "How many squares are there on the grid?" (100 squares.) "How many squares are shaded? (15) What is a decimal number for the squares shaded? (0.15) Fifteen hundredths of the square have been shaded. Fifteen percent is the same as fifteen hundredths." Write the following example on the chalkboard.

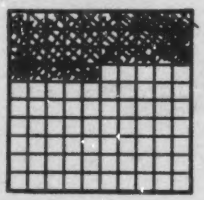
e.g.,

15% = 0.15

Ask the students to copy this example into their notebooks. Say, "Take out another grid and shade in 35% of the grid." Model this for the students on the demonstration grid.

e.g.,

35% shaded



Discuss the number of squares shaded (35) in comparison to the number of squares on the grid (100). Ask, "Who can name a decimal for the number of squares shaded?" (0.35) Explain that 35% is the same as 0.35.

e.g., 35% = 0.35.

6.07.04

STRATEGY 1: cont'd	Ask the students to write this example in their notebooks. Continue this procedure, using other percents.

STRATEGY 2: Write the following examples on the chalkboard:

18% = ______

5% = ______

Say, "We can write any percent as a decimal because the percent symbol means per hundred. To change a percent to a decimal, move the decimal point two places to the left of the number and remove the percent symbol."
e.g.,

18% = .1 8. = 0.18

Say, "Sometimes we have to add zeros to complete the decimal numeral. 18% is equal to 18 hundredths." Ask the students to write this example in their notebooks.

Say, "Three percent can also be written as a decimal. Move the decimal point two places to the left, add zeros, and remove the percent symbol.
e.g.,

3% = 0.0 3. = 0.03

6.07.04.02 express fractions and decimals as an equivalent percent

STRATEGY 1: Prepare a set of 10x10 grids and a class set of colored pencils or crayons. Distribute these materials to the students.

Say, "Place one of your grids in front of you.

STRATEGY 1: cont'd

Shade in 35 of the squares." Give the students time to shade in the squares. Model shading the squares on the demonstration grid at the chalkboard.

Say, "How many squares are on this grid? (100) How many squares are shaded? (35) What fractional number can we use to represent the number of shaded squares on the grid?" ($\frac{35}{100}$).

Write $\frac{35}{100}$ on the chalkboard next to the demonstration. Say, "35 of the 100 squares are shaded. The fraction $\frac{35}{100}$ represents the number of shaded squares on the grid." Ask, "How would we write the number of shaded squares using decimal notation?" (0.35)

Write $\frac{35}{100} = 0.35$ on the chalkboard next to the demonstration grid. Say, "The decimal numeral 35 hundredths represents the number of shaded squares on the grid. A percent is a ratio which compares a number to 100. The symbol that we use to show percent is (%)." Write the percent (%) symbol on the chalkboard.

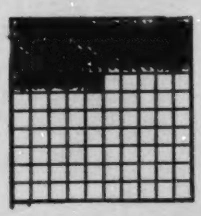
Say, "We can use the percent (%) symbol to represent the number of shaded squares on the grids. 35 hundredths or 35 of the one hundred squares are shaded."

e.g.,

$\frac{35}{100} = 0.35 = 35\%$

$\frac{35}{100} = 35\%$

$0.35 = 35\%$



Say, "Now pick another grid. Shade in seven of the squares." Give the students time to shade in the grid. Model shading seven squares at the chalkboard. Say, "Write a fractional number to show how many squares are shaded. ($\frac{7}{100}$) Write a

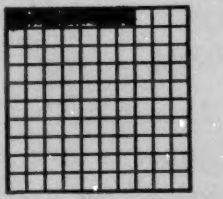
STRATEGY 1: cont'd

decimal number to show how many squares are shaded." (0.07) "What percent of the grid is shaded?" (7%)

e.g.,

$$\frac{7}{100} = 7\%$$

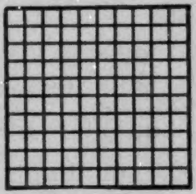
$$0.07 = 7\%$$



Say, "Each square in the grid represents one percent. Shade in 25 percent of the squares of another grid."

e.g.,

25% shaded

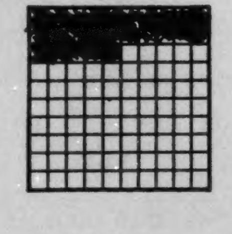


Say, "Write a fractional numeral and a decimal numeral to show how many squares have been shaded on the grid." ($\frac{25}{100}$; 0.25)

e.g.,

$$\frac{25}{100} = 25\%$$

$$0.25 = 25\%$$



Repeat this procedure, using other percent values.

STRATEGY 2: Write the following activity on the chalkboard. Ask the students to complete the activity in their notebooks.

	Fraction	Decimal
1)	$\frac{46}{100}$	
2)	$\frac{3}{100}$	
3)	$\frac{75}{100}$	
4)	$\frac{12}{100}$	
5)	$\frac{50}{100}$	

STRATEGY 2: cont'd

Say, "Complete the activity by writing the decimal numeral for each fraction." Give the students time to complete the activity. Then ask different students to go to the chalkboard to complete the activity.

	Fraction	Decimal
1)	$\frac{46}{100}$	0.46
2)	$\frac{3}{100}$	0.03
3)	$\frac{75}{100}$	0.75
4)	$\frac{12}{100}$	0.12
5)	$\frac{58}{100}$	0.58

Say, "A percent is a ratio which compares a number to 100. The symbol that we use to show percent is (%)." Write the percent (%) symbol on the chalkboard. Say, "We can write each of our fractional and decimal numerals as a percent." Now add the column labeled Percent to the previous activity on the chalkboard.

e.g.,

	Fraction	Decimal	Percent
1)	$\frac{46}{100}$	0.46	
2)	$\frac{3}{100}$	0.03	
3)	$\frac{75}{100}$	0.75	
4)	$\frac{12}{100}$	0.12	
5)	$\frac{58}{100}$	0.58	

Say, "46 over one hundred is equal to 46 hundredths. As a percent we write this as 46%."

Write:

	Fraction	Decimal	Percent
1)	$\frac{46}{100}$	0.46	46%

STRATEGY 2: cont'd

Say, "Complete the rest of the table by writing the equivalent percent for each fraction and decimal."

Review the answers with the students.

6.07.04.03 **solve word problems related to skills learned in this module**

STRATEGY 1: Write the following chart on a rexograph sheet.

e.g.,

Amount Of Money Saved	Annual Interest Rate	Interest Earned In One Year	Balance At Year End
$ 300.00	5%	$15.00	$315.00
150.00	4		
275.00	2		
500.00	9		
130.00	11		
240.00	8		
617.00	6		
900.00	7		
110.00	3		
295.00	9		
660.00	12		
1,100.00	14		

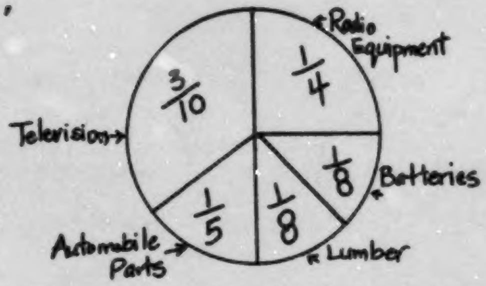
Say, "When you deposit money in a savings bank, you allow your money to work for you. A bank uses all of the money that people deposit in their savings accounts. The bank pays you for using your money; this payment is called interest. The first two columns of this chart show the amount of money in the savings account and the rate of interest that the bank is paying for the use of your money. Fill in the interest earned for the year and the balance after the interest has been added to the account."

6.07.04

STRATEGY 2: Draw the following graph on the chalkboard. Distribute a rexograph sheet which has an empty circle graph to each student.

The S.S. Piggy was sailing to Europe with cargo. The circle shows the distribution of that cargo.

e.g.,



Say, "Convert each of the fractions to percent and then rewrite the circle graph using percents."

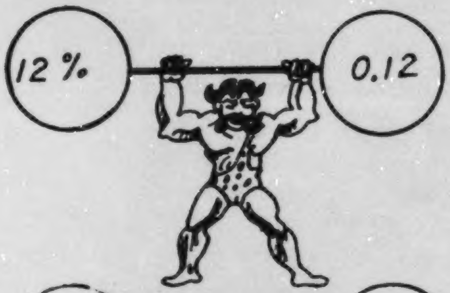
e.g.,

Repeat this procedure using other examples.

P.O. 6.07.04. 01

NAME:____CLASS:__________DATE:________

Directions: Change each percent to a decimal.

1.


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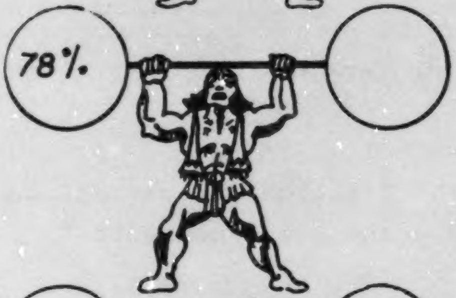

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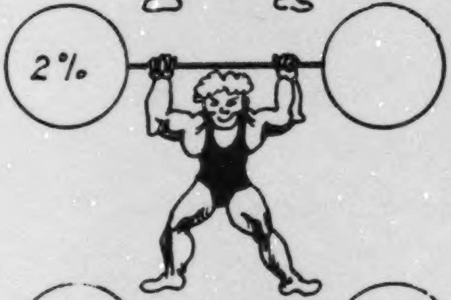

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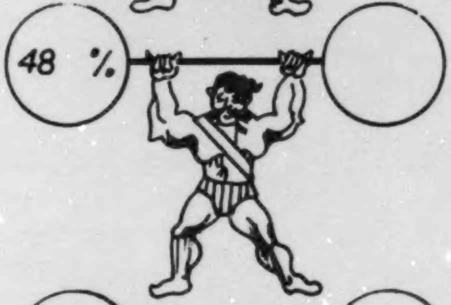

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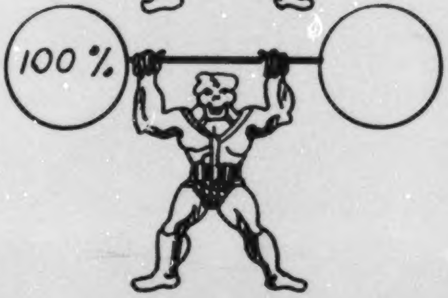

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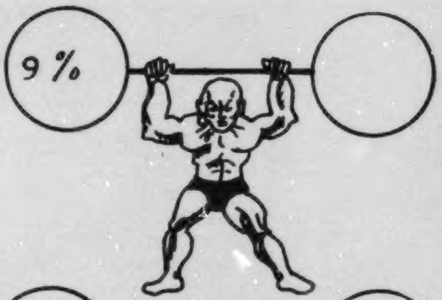

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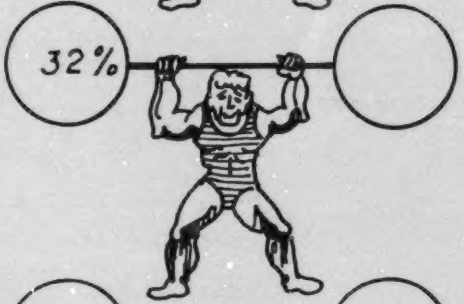

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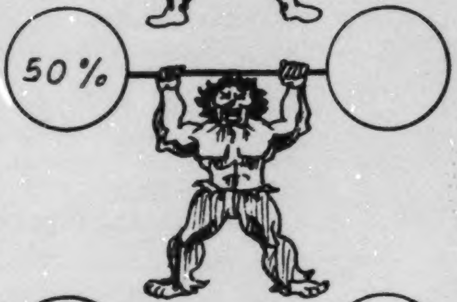

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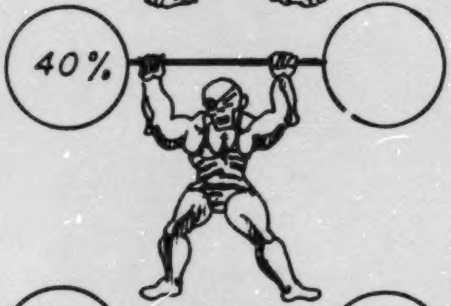

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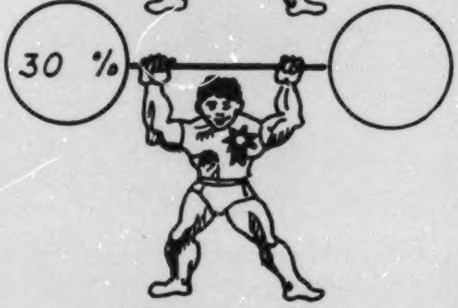
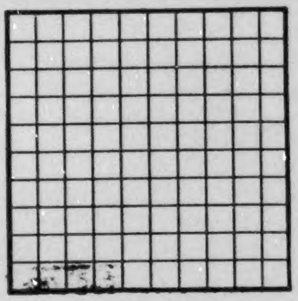


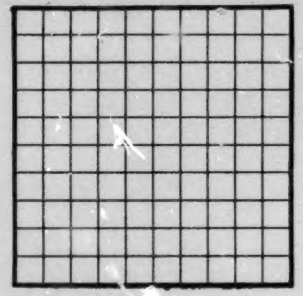
P.O. 6.07.04.02

NAME:______________________________ CLASS:__________ DATE:________

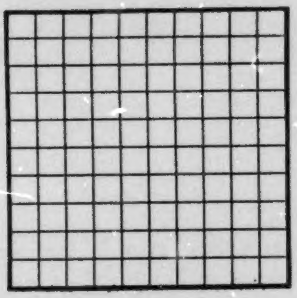
I. Shade in the given percent on each square.



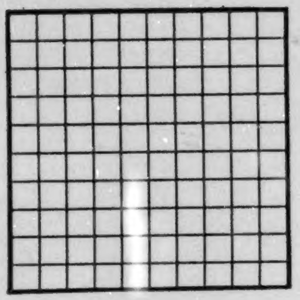
Shade 4%



Shade 27%



Shade 50%



Shade 62%

II. Complete each of the following.

$\frac{1}{2}$ = __________ %

0.80 = __________ %

$\frac{3}{4}$ = __________ %

0.05 = __________ %

$\frac{3}{5}$ = __________ %

0.54 = __________ %

$\frac{4}{5}$ = __________ %

1.68 = __________ %

13.3 = __________ %

2.55 = __________ %

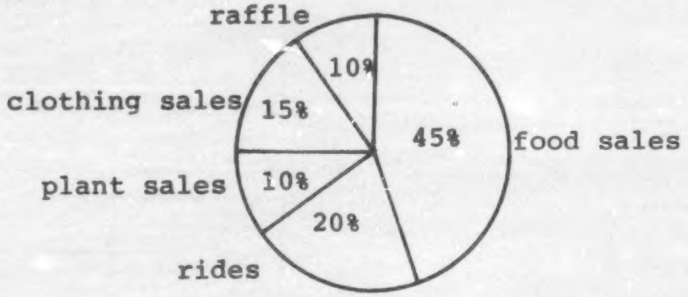
P.O. 6.07.04.03

NAME:______________________________CLASS:________DATE:______

Directions: I. Calculate the amount of money that was raised from each activity at the Block Party.
II. Solve the problems.

I.

The Oak Street Block Party raised $750.00 for neighborhood improvement. The circle graph shows what percent of the money was raised by different activities. How much money was raised from each activity?



a) food sales ________

b) clothing sales ________

c) raffle ________

d) rides ________

e) plant sales ________

II.

1) 100 people attended the school play. Twenty-five were youngsters. What percent of the audience were youngsters?

answer: ____________

2) Bob's record collection totals 125 records. 50 records are rock music. What percent are rock?

answer: ____________

3) John planted 60 corn plants. Forty-five were destroyed by insects. What percent were destroyed?

answer: ____________

4) There are 24 cans of soda in the refrigerator. Six of the sodas are root beer. What percent are root beer?

answer: ____________

Unit 25

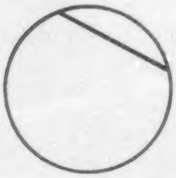
6.09.01 CIRCLES
(3-4 lessons)

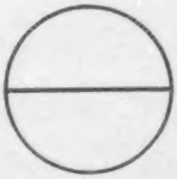
PERFORMANCE OBJECTIVES

The student will be able to...

6.09.01.01B identify and define terms relating to a circle;
e.g.,

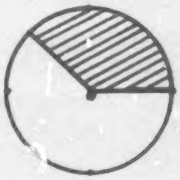
A chord is a line segment that has its two endpoints on the circle. It may or may not pass through the center. A diameter is the longest chord and passes through the center of the circle.





6.09.01.02B describe and measure central angles;
e.g.,

The arc that has the measure of $\frac{1}{3}$ of the circle determines an obtuse angle.



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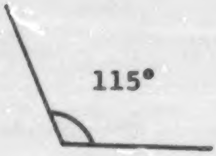
***6.09.01.03A** construct angles given specific angular size in degrees using the protractor. e.g.,



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6.09.01

VOCABULARY

TERMS

chord
diameter
radius
arc
central angle
degree

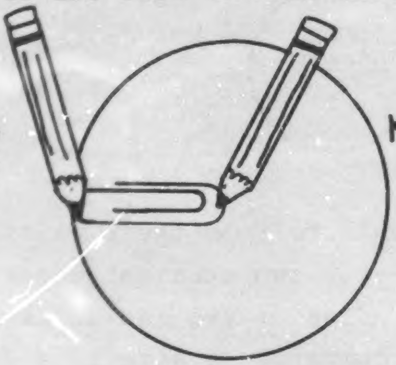
TERMS

protractor
acute angle
right angle
obtuse angle
straight angle
vertex

GETTING STARTED

Distribute one paper clip and two pencils to each student and demonstrate how to use them to draw circles.

e.g.,



Keep this pencil inside the paper clip and form a circle by moving it up or down.

Keep this pencil on this fixed spot.

Show several circle designs you have prepared and encourage students to create a design of their own.

Use two rulers to demonstrate acute, right, obtuse, and straight angles. Discuss the degrees of each angle. Write the following on the chalkboard and have the students copy it into their notebooks.

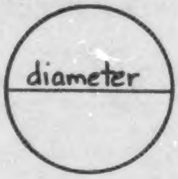
acute ∢ = less than 90°
right ∢ = 90°
obtuse ∢ = larger than 90°
straight ∢ = 180°

6.09.01

6.09.01.01 **identify and define terms relating to a circle**

STRATEGY 1: Distribute two paper circles to each student. Ask the students to fold one of the circles in half. Explain how this folded edge is the longest line that can be drawn through the circle. It will always pass through the center of the circle. It is called the diameter (from the words, diagonal, and meter, to measure.)

e.g.,



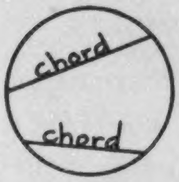
Ask the students to fold their half circle in half. Say, "Observe the two straight edges. These are called "one radius or two radii." Ask, "Do you know how a radius compares in size to a diameter?" (A radius is always one half of a diameter of a circle.) Explain how a radius is the necessary measurement needed when drawing a circle. Demonstrate by drawing several circles on the chalkboard, using different lengths of string around a piece of chalk, as radii. Ask the students to flatten the circle and label one diameter and two radii.

Ask the students to fold their second circle but not through the center of the circle. Ask them to make five folds, being careful not to go through the center of the circle. Explain that each of these lines is called a chord of the circle.

STRATEGY 1: cont'd

Summarize the definition of a chord and ask them to label two or three chords on their circle.

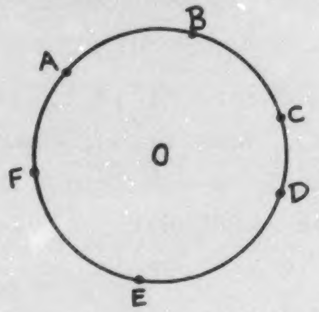
e.g.,



STRATEGY 2:

Prepare a rexograph sheet on which you have drawn a large circle with its center labeled O and several points on the circumference labeled A, B, C, D, E and F. Distribute a copy to each student.

e.g.,



Say, "Draw a straight line between O and A. Do you think the distance from O to A is the same as O to D and O to C?" Say, "This distance defines the circle and it is called the radius of the circle."

Say, "Connect O and E." Help the students summarize a relationship of size between OA and EA. Name this line diameter.

Say, "Connect D and A. Is this a diameter? Connect C and B, C and F, and D and E. Are any of these lines diameters? Why or why not?"

Ask why the other lines are not diameters. (They do not pass through the center of the circle.) Name these lines chords.

6.09.01

6.09.01.02 describe and measure central angles

STRATEGY 1: Distribute a large paper circle to each student. Ask them to fold the circle in half. Ask, "Do you remember the name of the folded edge of the circle?" (Diameter.) "What kind of angle is formed by the diameter of any circle?" (straight angle) "How many degrees are there in a straight angle?" (180°)

Say, "The degrees in the straight ∢ will be the same for all circles no matter what their size." Demonstrate by showing some larger and some smaller folded circles.

Ask the students to fold their half circles in half again. Ask, "What kind of angles are formed?" (right angles) Demonstrate that the size of the angle is not related to the length of the sides, but rather to the opening between them.

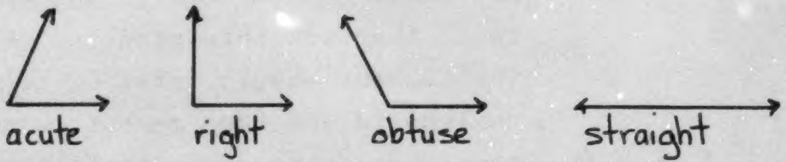
Use two rulers or geo-rule to demonstrate acute, right, obtuse and straight angles. Now put these angles into the circle where their vertex is at the center of the circle. Ask, "What are the sides of these angles?" (Radii.) Say, "Such angles are called central angles in a circle."

STRATEGY 2: Make a large poster of a circle with one radius drawn in a bright color. (Label it OA.) Through point O, fasten a piece of colored string or yarn, longer than a radius. Ask the students to remember the number of degrees in a circle (360°). Place the yarn radius in several different positions to estimate the degrees between the fixed radius and the moving radius each time.

STRATEGY 2:
cont'd

Help students summarize how the angles were formed. (The vertex is at the center of the circle. The sides were radii.) Review these central angles and classify them as acute, right, obtuse or straight angles.

e.g.,



6.09.01.03 **construct angles given specific angular size in degrees using the protractor**

STRATEGY 1: Distribute a protractor to each student. Say, "Place the protractor on any line of your paper so that the arrow at the center of the straight edge is on the blue line and the zero mark at each end of the straight edge is also exactly on the line. Make a dot at each of these spots, take the protractor away and connect the three dots with a straight line."

It may be necessary to do this several times before all of the students succeed in getting one straight line. Using the demonstration protractor, show the need for accuracy.

When this has been accomplished, proceed with marking other angles of various degrees.

e.g.,

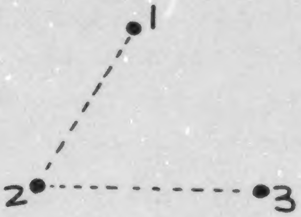
> Put a dot at the arrow, a dot at the zero on the right and a dot at 70° on the inner scale. Connect the dots and you have drawn an angle of 70°.

STRATEGY 1: cont'd Repeat this procedure using other angles until the students have acquired facility using a protractor.

STRATEGY 2: Use the demonstration protractor to mark three dots on the chalkboard, which when connected in their numbered order 1, 2, 3, will make an angle of 60°. Ask a student to come to the chalkboard and connect them. Then ask this student, "What's my angle?" The student should first write an estimate on the chalkboard and then measure with the protractor for the accurate degree measurement. If he/she reads the angle accurately, he/she can use the protractor to outline a new angle with three numbered dots. He/she now asks another student to come to the chalkboard and respond to the question, "What's my angle?"

Since students like to play "What's My Angle?" you may wish to play the game in teams. Be sure to restrict angles to ten degree intervals, or at most five degree intervals. (Readings of endings in smaller subdivisions will make the game too slow moving for beginners.)

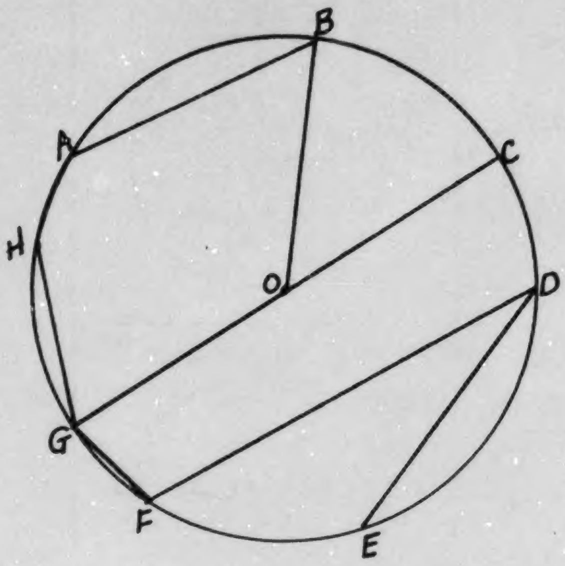
e.g.,

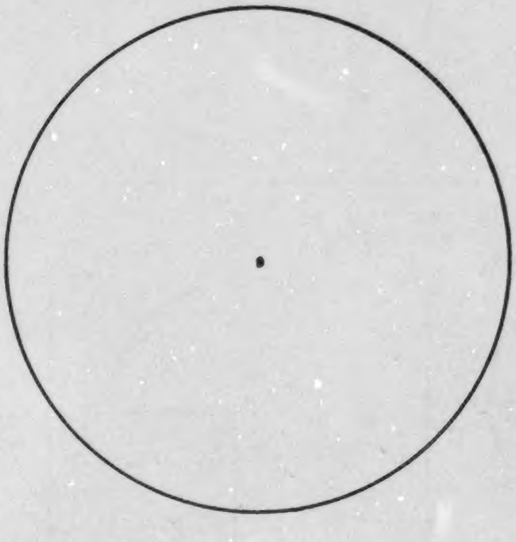


P.O. 6.09.01.01

NAME: ______________________ CLASS: ________ DATE: ______

Directions: Classify the lines as radius, diameter or chord. Make a design inside the circle using 12 chords. No radii or diameters permitted.

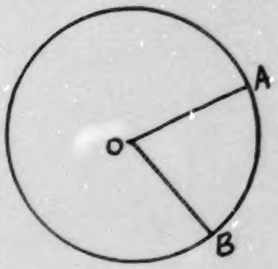


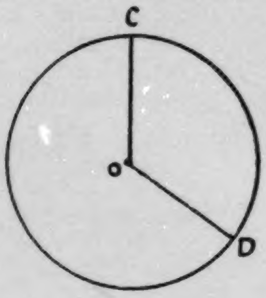


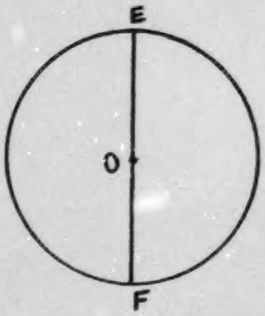
P.O. 6.09.01.02

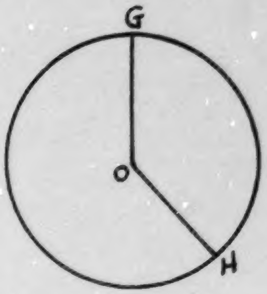
NAME: ______________________________ CLASS: __________ DATE: ________

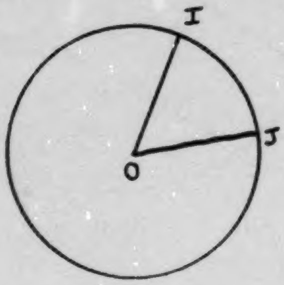
Directions: Identify the central angles on the worksheet: acute, right, obtuse, or straight.

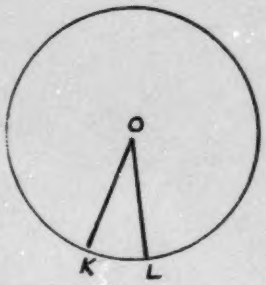


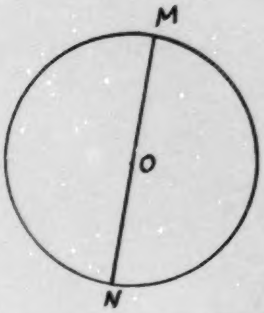


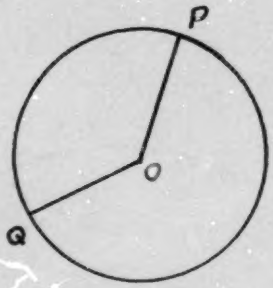


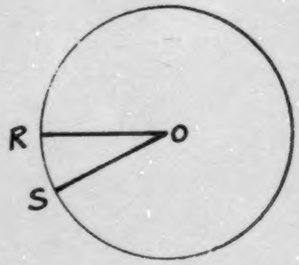




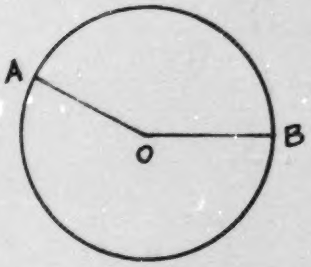


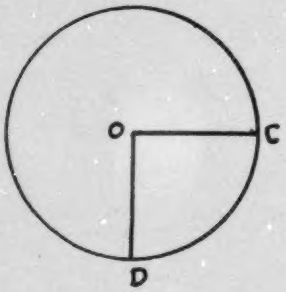


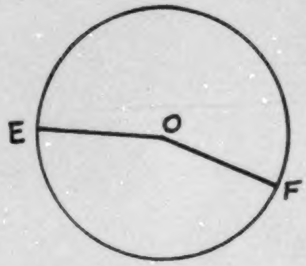




Could these three angles be put together to make a circle?
If not - why not?





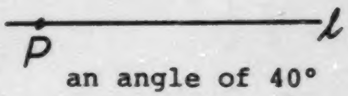


P.O. 6.09.01.03

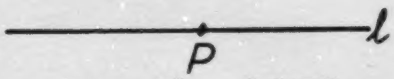
NAME:______________________________ CLASS:__________ DATE:________

Directions: Draw the angles of various degrees using your protractor.

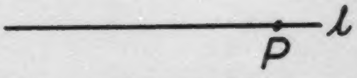
A. Using line l as one ray and point P as a vertex draw:



an angle of 40°



an angle of 120°

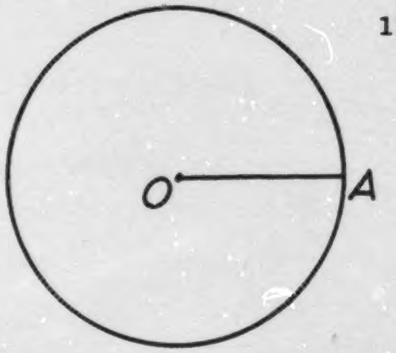


an angle of 90°

B. Use point V as vertex and draw two 90° angles side by side.

C. Use O as the vertex and OA as the first side, draw these angles attached to each other.

150°
90°
120°



D. Use A as a vertex and draw these angles attached to each other. 80° and 60°.

How many degrees are in the 3rd angle?

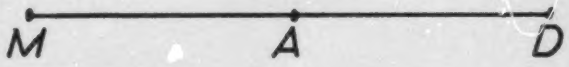


TABLE OF SYMBOLS

DEFINITIONS	SYMBOL	DEFINITIONS	SYMBOL
plus; add; positive	+	line	↔
minus; subtract; negative	-	ray	→
plus or minus	+ or -	perpendicular lines	⊥
times; multiply	· or X	parallel lines	∥
divide	÷	degree	°
divide	⟌	equals	=
square root	√	is not equal to	≠
cube root	∛	is less than	<
angle	∡	is greater than	>
between two numerals or letters at the end of a series or sequence; and so on	...	encloses a set when numbers are included: empty set when empty	{ }
		subset	⊂
triangle	△	intersection	∩
rectangle	▭	union; join	∪
parallelogram	▱	percent	%
circle	⊙	foot, minute	'
		inch, second	"
line segment (as $\overline{AB}$)	—		

METRIC TABLE

PREFIX	VALUE	LENGTH	CAPACITY	WEIGHT (MASS)
KILO	1000	kilometer* (km)	kiloliter (kl)	kilogram* (kg)
HECTO	100	hectometer (hm)	hectoliter (hl)	hectogram (hg)
DEKA	10	dekameter (dam)	dekaliter (dal)	dekagram (dag)
	1	meter* (m)	liter* (l)	gram* (g)
DECI	$\frac{1}{10}$ or .10	decimeter (dm)	deciliter (dl)	decigram (dg)
CENTI	$\frac{1}{100}$ or .01	centimeter* (cm)	centiliter (cl)	centigram (cg)
MILLI	$\frac{1}{1000}$ or .001	millimeter* (mm)	milliliter (ml)	milligram* (mg)

* most frequently used

BASIC CLASSROOM EQUIPMENT CHECKLIST

MATERIALS:

- Abacus - Class size/individual. ____
- Attribute blocks................ ____
- Balance Beam.................... ____
- Calculators..................... ____
- Calendar - class size........... ____
- Clock - large - class size...... ____
- Clock - individual size......... ____
- Clock - stamp................... ____
- Coin stamps..................... ____
- Compass......................... ____
- Cubic counting blocks........... ____
- Cuisenaire rods................. ____
- Dominoes........................ ____
- Felt cut-outs................... ____
- Flannel board................... ____
- Flash cards..................... ____
- Fractional parts (assorted)..... ____
- Geo boards...................... ____
- Geometric patterns.............. ____
- Hundred charts - class size/ind. ____
- Laminating paper................ ____
- Magnetic board.................. ____
- Magnetic discs.................. ____
- Measuring tools-English, Metric (rulers, scales, compasses, protractors, beakers, cups, spoons, thermometers)........ ____
- Number lines - class/individual. ____
- Numerals - tactile.............. ____
- Plastic discs................... ____
- Play money...................... ____
- Powers of Ten................... ____
- Protractor...................... ____
- SEE calculators................. ____
- Scale........................... ____
- Screen (pull-down type)......... ____
- Spinners........................ ____
- Squared place value material.... ____
- Standard playing cards.......... ____
- Tangrams........................ ____
- Tens frame...................... ____
- Timers (1,2,3 minute)........... ____
- Tokens (various sizes/colors)... ____
- Trundle wheel................... ____
- Unifix cubes.................... ____
- Unifix 100 board................ ____

SUPPLIES:

- Adding machine tapes (for classroom/ind. number lines)...... ____
- Chalk........................... ____
- Construction paper.............. ____
- Elastic bands................... ____

BASIC CLASSROOM EQUIPMENT CHECKLIST

SUPPLIES: cont'd

Envelopes (all sizes).......... ____
Erasers, board/individual...... ____
Felt pens (all sizes).......... ____
Ditto, Rexograph paper......... ____
Glue........................... ____
Gram weights................... ____
Graph paper (1 cm, <, 1")...... ____
Grease pencils................. ____
Oak tag........................ ____
Paper clips.................... ____
Paste.......................... ____
Plastic discs.................. ____
Pointer........................ ____
Primary pencils................ ____
Rubber bands................... ____
Scissors - primary, left hand.. ____
Scotch tape.................... ____
Spinner........................ ____
String......................... ____
Tape........................... ____

COLLECTIBLES:

Beads and beans................ ____
Bottle caps.................... ____
Buttons........................ ____
Cardboard (all sizes).......... ____
Cereal boxes................... ____
Coffee cans.................... ____
Detergent boxes, shoe boxes, meat trays, and plastic containers.................. ____
Egg cartons.................... ____
Felt for desk mats............. ____
Ice cream sticks............... ____
Juice containers............... ____
Macaroni....................... ____
Magazines...................... ____
Menus.......................... ____
Metrically measured cartons.... ____
Milk containers................ ____
Newspapers..................... ____
Paper plates................... ____
Sand........................... ____
Spools......................... ____
String, yarn................... ____
Styrofoam...................... ____
Tongue depressors.............. ____
Wire hangers................... ____
Ziploc Bags.................... ____